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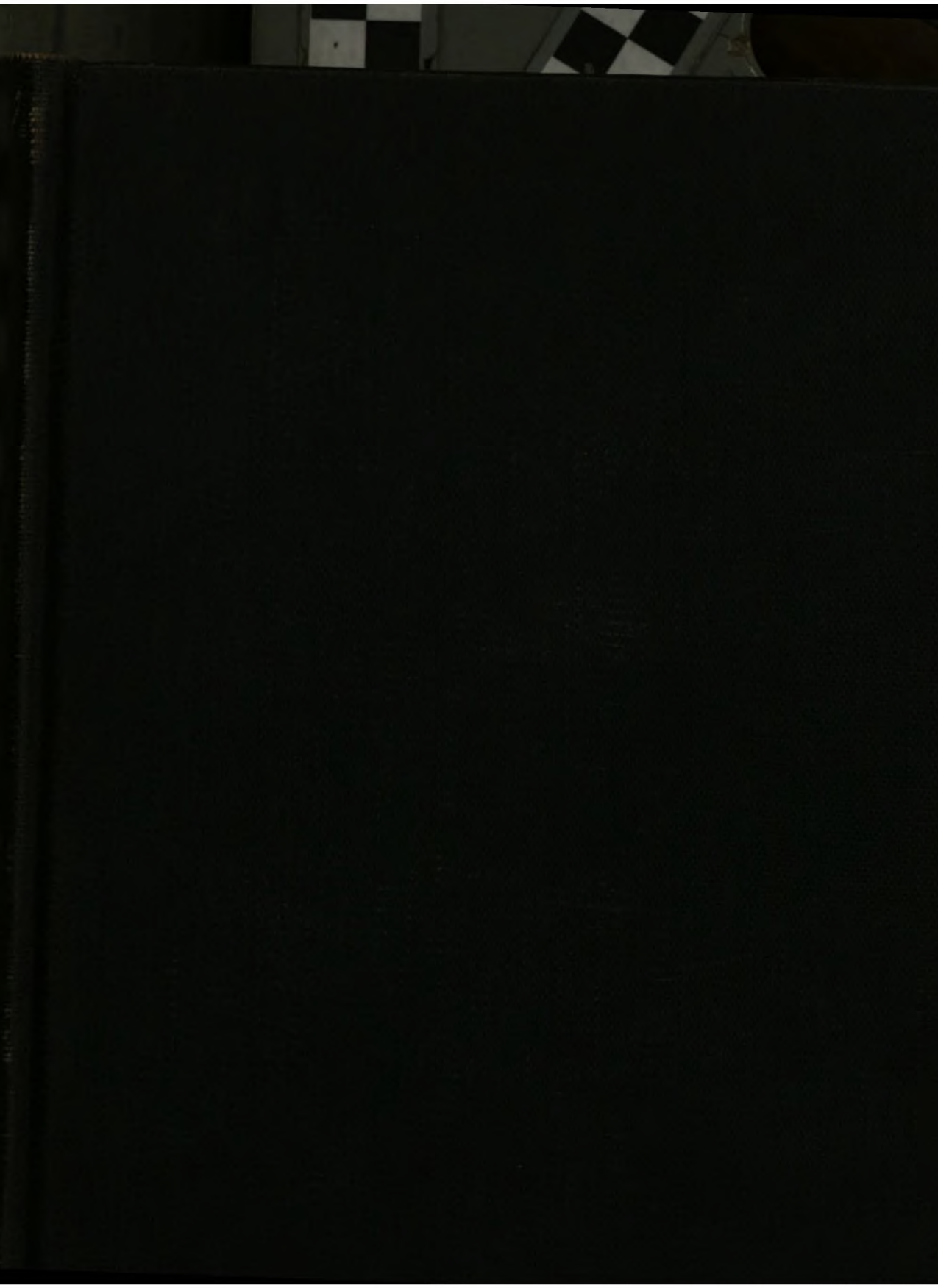
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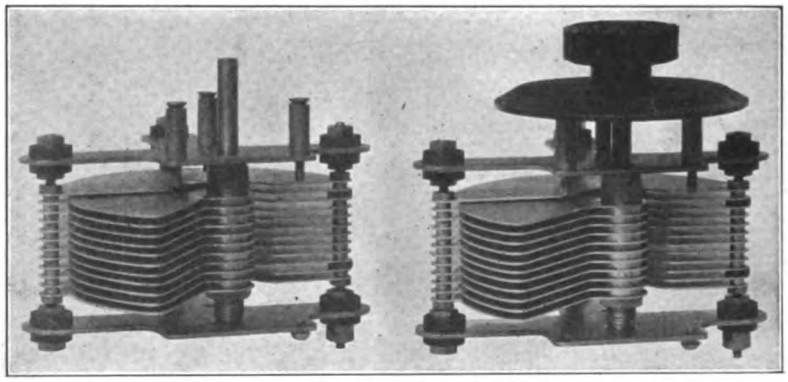
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A MAGAZINE DEVOTED EXCLUSIVELY TO THE WIRELESS AMATEUR



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QST

AUGUST, 1920

VOLUME IV No. 1

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QST
A Magazine Devoted Exclusively to Amateur Radio

The A.R.R.L. QSS Tests

The Bureau Tests End and the League Tests Begin.

AS this article is written, the A.R.R.L. Fading Tests are beginning all over the country, and we have every reason to feel that they will be as interesting and as successful in the securing of valuable data as were the co-operative Bureau of Standards A.R.R.L. tests.

Readers who are not familiar with the tests are referred to the opening articles in the two preceding issues of QST, where complete details are announced. In each A.R.R.L. Division transmissions by well known stations have been arranged, and a form for checking the variation of audibility is given. The Division Managers have appointed Fading Analysts for each section, and a uniform system of tabulating and studying the data has been adopted.

If we all pull together on these tests, much of scientific value should be accomplished. It is hoped that every A.R.R.L. man will feel it a duty to participate and aid in this important work. All stations are requested to keep their transmitting at a minimum during the time of these tests in their territory.

It is believed that experience in the conduct of these tests will show that the system being followed can be improved, so that rather than continue this first series indefinitely it has been thot advisable to announce Aug. 31st as the concluding date. Referring then to the schedule published in last month's QST, all schedules for dates after Aug. 31st are hereby cancelled. Division Managers will arrange for the broadcasting within their division, at the proper time, of any portions of their schedules not published in full up to Aug. 31st in the July issue.

There are two corrections in the New England Division schedule as published. Aug. 14th for 1PG, read 1PY, Westerly, R. I. Aug. 28th, for 1WR, read 1AK, Fall River, Mass. 1KAY is Portland Me.

Now a word to the recorders. Make curves on as many transmitters as you can, but if the schedules call for transmitting on each test night by stations in adjoining divisions and you can get either one at will, pick out the one to which you will regularly devote your attention and record it every possible test night at that time. That is, do not switch your recording to a new station every night—it is more important to have regular reports on the same transmitter, so that variations from normal reception may be noted. The recording form calls for a check-mark in the proper square. This works very satisfactorily where the swinging is gradual, but some stations fade so rapidly as to go thru most of their cycle during the transmitting of one group of letters. In such cases it is suggested that numerous small dots be tallied (possibly one per letter, even), to be connected by a curve immediately after the schedule. Another important thing is that a record on a station whose signals are extremely loud thruout the transmission will not show fading and will therefore be without value. If a station is regularly received with intensity 9, reduce filament current or cut out a stage of amplification. This will reduce the strength to a value where changes in audibility will be readily noticed. But be sure to note on the record that this has been done and also, if possible, note during the QST call the strength with the set in normal order.

Because progress in the Bureau of Standards tests showed that some rearrangement of the station network would add greatly to their value, the tests were terminated on July 17th. This was in accordance with the original scheme. Improvements in the methods of transmitting and recording are under consideration, and these will make it possible to plan future tests very satisfactorily. The network laid out for these first tests by our Operating Department

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has worked to perfect satisfaction, and some remarkably fine work has been done by the participating stations. These men should feel that a difficult task has been well performed, and the Bureau wishes to thank them sincerely for their efforts.

As soon as the Bureau completes the tabulating of the data and draws conclusions therefrom, they will be announced thru the A.R.R.L. So far, the indications are that the phenomena are caused by reflection or refraction of the waves, as has long been believed by many. Perhaps the most striking feature of the tests is that no cases of fading revolving around the transmitter have been observed, as was expected by many of us, but inverse curves have been noted both on opposite sides of the transmitter and, more important, on the same side of the transmitter at different distances. This last feature is intimately bound up with what is being called "progressive fading", the occurrence of certain phenomena successively along the curve at different points in the same general line from the transmitter. The Bureau cites as an instance, a particular part of a curve on the signals of 2JU which began at Hartford with the letter A; at Bristol, Conn., with the letter B; at Laconia, N. H., with the letter G; and at Boston with the letter H. It is believed that a study of the distances, time factor, and phase relations in such instances will make it possible to determine the location of the reflecting media, if such exist, which caused the phenomena. From this we may hope to learn the nature of the medium, and so progress to methods for overcoming the fading evil.

The Bureau is of the opinion that the so-called changes of received wave length, as reported in QST by correspondents, are largely receiving circuit effects. A regenerative receiver is very critical as to filament temperature and a small change in this factor causes marked tuning effects. These can be compensated for by readjusting the set, the operator receiving the impression that the incoming wave has changed. Another important thing is that the adjustment of a regenerative set that is best for strong signals is not the same as the best adjustment for weak signals of the same wave length, and as it is virtually impossible to tell whether a particular adjustment of such a set is a tuning or regenerating adjustment, the operator is easily deceived into the belief that the wave length has changed. This would not occur in non-regenerative receivers, but the latter do not have the needed sensitiveness. It is believed possible, however, for a transmitter emitting a band of wave lengths to fade out on one wave length at a particular receiving point and simultaneously swing in on another wave, for the reason that two different frequencies when reflected or refracted by the same conducting mass or surface, do not interfere subtractively at the same point. Mr. Frank Conrad, of 8XK, has suggested that a sending station with two "humps" sufficiently far apart could send to a receiving set tuned to both waves with a very good chance of unbroken reception, and supporting this theory is the observation that, so far as known, it is not possible to recover the signals of a fading C.W. (or modulated C.W.) station by retuning.

All in all, the QSS Tests are proving immensely interesting and promise to develop information on short wave transmission problems which will prove of the highest value to us amateurs. Watch QST for further information.

A Ham On The Telephone

By Tewpieye

2PI makes his debut in QST with a good one. Ever imagine what radio nomenclature must sound like to the uninitiated? This is a story about just that.—Editor.

MR. JAMES BARNEY was an ardent "ham" and lover, and often wavered in his fidelity between the two extremes. When in the equally captivating presence of one the other was generally completely obliviated, but he occasionally inoculated sentimentality into the ether by rather obvious code MSG's to his other affinity via the A. R. R. L. One afternoon, following a futile endeavor to raise some easily imposed-upon station who would accept his MSG which according to cable count would have made its recipient a millionaire, he finally resorted to the telephone.

Now Mr. Barney was a resident of a New York apartment house and consequently suffered all their advantages and equally enjoyed their manifold discomforts. He frantically oscillated the unoffending phone hook, yelled profanely into the transmitter and placed his receiver in proximity to the mouthpiece without raising the slightest satisfying squeak, before he

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ultimately replaced the damaged phone stand, and carefully noting that the receiver was NOT on the hook, made his fuming way to the real estate office, in the building. He was there informed that service was NIL, owing to the absence of an operator, and that in all probability it would continue so for an indefinite period. Sensing a chance to make the maximum of money with the minimum of work, James offered his able self in the temporary capacity of switchboard operator. Needless to say he was immediately accepted.

After settling himself with all possible comfort in the operator's chair his first act officially was to remove the caps from the receivers. Making a serious pretext of tightening some perfectly firm binding posts he savagely jammed a plug into Central.

"Number please?"

"QSD", in an interrogative tone.

"Number please".

"QSD QSD P-S-E".

"Do you want information?"

"No—no". Then comprehending that all operators did not necessarily come under genus radio, James condescended to the explanatory—

"QSD what time have you?"

"Four twenty-five."

"OK Thanks old man, call you later." Crash, and the plug returned to its place.

After painfully setting his watch, the erstwhile operator, paying not the least attention to the frantic dropping of a paltry dozen or so annunciators, again plugged Central and gave her the number of his lady love. There then ensued a beautiful half-hour conversation, interrupted but once when Mr. Barney smothered the persistent buzzer with his cap.

As soon as this conversation reached the ultimate of its many endings, James again experimented with his apparatus ere he felt competent to answer the now innumerable calls. He jammed in half of the party plugs and leaned heavily on as many trunk buttons and anxiously awaited the result.

The inevitable happened. Half the population of the house answered with a confused "Hello hello".

James, not quite expecting this, was at a loss as how to reply, but his radio intelligence soon came to his rescue.

"Testing-testing — de-de-de-dah," he bawled into the transmitter, and desperately yanked the plugs.

Having at last determined which were the party jacks by the above conclusive tests, he cautiously proceeded to answer calls.

"Hello, hello, O.K. now, shoot."

"Connect me with the real-estate office, please".

"Sorry but they piped down about an hour ago."

"They what?"

"Piped down, layed off, closed shop" explained the sophisticated James. "I'll take an MSG for them though."

"Oh they are closed—Well this is important. Will you please give them a message as soon as they open?"

"QSR".

"What?"

"Sure thing, I'll relay the message. Shoot".

"Well, just tell them that the people below are making an awful noise. It's some sort of a telegraph affair, and their wires come right down outside of our windows. Our wash-woman was almost killed when she hung clothes on it last Monday. We can't sleep at all nights when it is buzzing, and our lights get dim and it is impossible to read. Also sparks fly from the ceiling in the dining room".

"Yes mam, that's outrageous. I shall report it and see that it is stopped." Mr. Barney made a mental reservation to replace his kick-back-preventer the next time he saw his set.

"Well", he soliloquized, it's sure lucky I got in on this. Gee, supposin' it had got to the office MIM. Ye Gods! Maybe there's some more of them flying around."

He plugged in on the apartment below his.

"Hello, this is the office speaking. Are there any complaints you wish to file this month, Mrs. Jackson?"

"Why, nothing in particular, only our lights went out last night and haven't been on since."

"Oh yes, well—er-er-the er-power company shut off the juice last night, Mrs. Jackson, but it will be on tonight."

Behold another mental resolution: to replace the fuses borrowed from the meter on the floor below.

"Well, now, I sure did nip that in the bud."

BUZZ, BUZZ, BUZZ.

"Hello-hello-hello-hel-l-l-l-oo. One, two, three, four, five, go ahead".

"Connect me with Mr. Stone's apartment, please, I've been trying to get you for the last half hour."

"Yes mam", and he shoved the plug into the handiest jack while he searched the list for Mr. Stone.

(Concluded on page 43)

Coming Soon

An analysis of the QSS reports in the "Bustands"—A. R. R. L. tests; a paper on the performance of our stations in these tests, by Mr. S. Kruse; some dope on the use of spark coils as a source of modulated plate potential for C.W. telegraphy; a cheap and easily-made rectifier which will give 350 watts d.c. for C.W. Watch for these articles.

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Navy Receiving Equipment

By L. C. F. Horle

Part II—Concluded

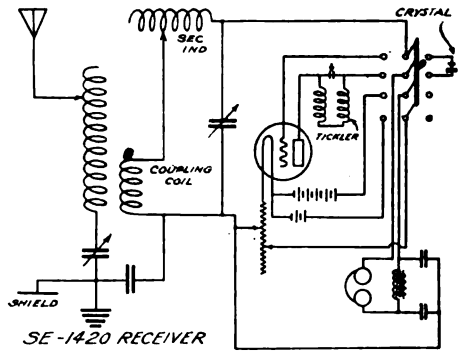
Presented at meetiug of the Radio Club of America, Columbia University, March 26, 1920

Under the able direction of Prof. Hazeltine, who was then connected with the Navy Dept. in a consulting capacity, much research was done before the actual design was started and the various developments of this research were incorporated in the SE-1420 receiver.

In the design of this receiver effort was made to secure wide wave length range, high selectivity, freedom from local interference, stability in regenerative amplification, simplicity of operation, compactness, durability, and cheapness of construction.

In conformity with established practice, both tuned circuits have inductance coils provided with taps, six in number, and continuously variable air condensers giving overlapping wave length ranges from 260 meters up to 6,000 meters when the capacity of the antenna is .0004, and up to 7500 meters when the capacity is .0009 microfarad. The practice of sectionalizing and disconnecting the unused portions of the windings to avoid "resonant coils" has been abandoned, the windings being now made continuous and merely short-circuited at the proper taps. This completely eliminates "resonant coils" and allows of a simple and rugged construction. The arrangement is such that the coupling between the short-circuited and the active portions of the coils is loose, so that little loss is introduced.

The chief factor contributing toward high selectivity in this receiver is the choice of a higher ratio of inductance to capacity than has hitherto been customary; the antenna condenser having a capacity of .0015 microfarad, and the secondary condenser of .00075 microfarad, whereas the type SE-1220 and other receivers of similar wave length range had capacities of .005 and .003 microfarad respectively. Compactness and proper distribution of



winding spaces are secured by reducing the size of the Litz wire used to 20 strands of No. 38 wire and by winding the successive taps in increasing numbers of banks.

Interference from short-wave nearby stations and from transmitting apparatus in close proximity to the receiver is eliminated by the use of grounded sheet-copper shielding completely enclosing and separating the antenna and secondary circuits. To completely eliminate capacity coupling, the coupling coil is provided with a novel electro-static shield consisting of an additional winding placed over it, the capacity current in this winding inducing in the coupling coil voltage which exactly neutralizes that resulting from capacity current in the coupling coil. The coupling coil is placed in the secondary circuit instead of in the antenna circuit chiefly for the purpose of obtaining sufficient coupling without the use of taps to secure the low wave lengths, as the inductance of the antenna would otherwise prevent this. To secure complete stability in regenerative amplification, the stopp-

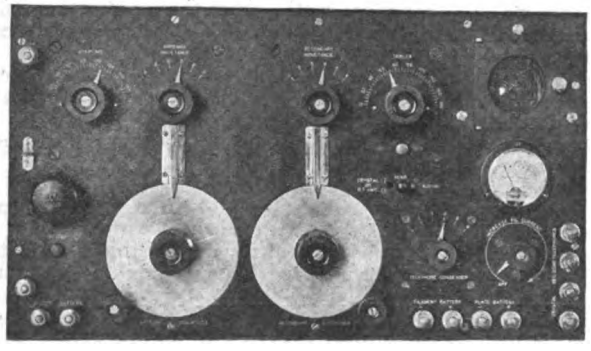


Fig. 3.
Panel View, SE-1420.

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ing condenser and grid leak are discarded, and the grid is connected through the secondary inductance to a point on the filament rheostat selected to give a negative grid potential or "bias" of about 1.3 volts with a Type SE-1444 tube, and about 2.2 volts with a Type CW-933 tube.

Oscillation control over the entire wave length range with both types of tubes above mentioned necessitates a large tickler, and in order to avoid resonant effects from this tickler at the shortest wave lengths, it is made in the form of a variometer, having a stationary part wound alongside of the secondary inductance coil, and allowing the plate circuit to be tuned.

The difficulty which frequently arises in short wave heterodyne reception from the capacity between the operator's hand and the secondary circuit (which may change the note sufficiently to make it inaudible) is eliminated by the use of an audio frequency choke coil and telephone condenser which prevents radio-frequency current from reaching the telephones.

The receiver permits the use of either the crystal or the vacuum tube detector, and contains within itself the receptacle and controls for the latter. The terminals of the secondary circuit are brought out for connection to a radio-frequency amplifier when the crystal-audion switch is thrown to the left. The standard auxiliaries, such as the filament ammeter, test buzzer, push button, etc., are clearly shown in the photograph, Fig. 3. The construction is simplified and cheapened by the introduction of unit assemblies, enabling the separate elements of the apparatus to be assembled independently instead of being built into a single panel.

Following the design of the SE-1420 receiver came the need for a radio compass receiver of greater selectivity and sensibility than had been available previously. The use of unilateral operation has been abandoned because of the difficulty in securing reliable bearings with the personnel available for operating the equipment. The possibility of using radio frequency amplification for this type of radio reception was investigated but it seemed evident while this investigation was being made that high power audio-frequency amplification would best meet the service needs, particularly since there was evidence at hand indicating that greater precision of bearing determination could be made if reception was done with the tube in oscillation. On the basis of this data the SE-1440 receiver was designed.

A series of amplifiers has been developed at the Radio Laboratory that should meet the needs of the service very satisfactorily. They are designed (1) to supply moderately high audio-frequency amplifications where conditions are such that an ordinary antenna is available, or (2) to supply high audio-frequency amplifications where low antenna or loop reception is to be done over a great range in wave lengths, or (3) to supply high radio and audio-frequency amplification where extremely high amplifications are necessary and where the range in wave lengths is not greater than three to one.

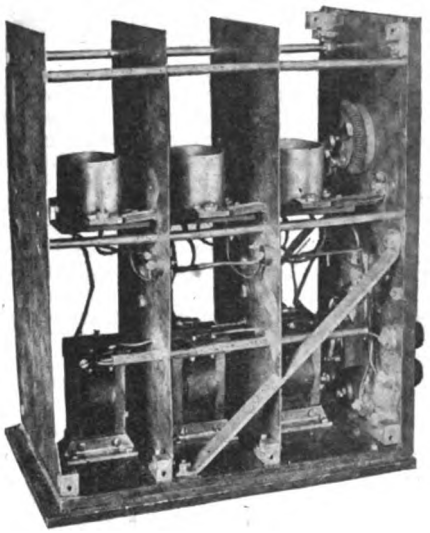


Fig. 4.
Three Step Audio Amplifier
(Electrically Shielded). SE-1599.

For use under conditions specified in (1), the SE-1600-A amplifiers are well suited. These amplifiers use two of the SE-1444 or CW-933 (Western Electric "J") tubes in connection with the two audio-frequency transformers.

The SE-1600-A uses iron core transformers. The coils of the transformers are machine wound with No. 44 copper wire. The layers are insulated from each other by means of paper and the whole coil impregnated with wax. The primary consists of 3900 turns and the secondary of 12,000 turns, the ratio being somewhat greater than three to one. The core is built up of 5-mil silicon steel. Three telephone jacks are provided by means of which the telephones may be connected in the plate circuit of the detector tube or in the plate circuit of either of the amplifier tubes.

For use under conditions outlined in (2) the SE-1599 amplifier has been designed. (Fig. 4). This amplifier consists of three amplifying tubes and three

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amplifying transformers of the audio-frequency type. The whole device is thoroughly shielded and every means adopted to make it free of disturbance due to interactions in itself or between it and other apparatus. It is designed to meet the need for very high amplifications where a wide range in wave lengths is essential. As such it is suited for operation with receivers supplied with "audion control boxes" or with receivers equipped with vacuum tube detectors. A two point telephone switch provides for cutting out the last stage of amplification when necessary. Further control of the amplification may be accomplished by adjusting the filament rheostat.

For use under the conditions outlined in (3) the SE-1611, SE-1613, SE-1615, and SE-1617 amplifiers have been designed. These amplifiers are of the radio-audio-frequency type and employ six SE-1444 tubes. Iron core transformers are used for both the radio and audio frequency amplifications. The radio frequency transformers are the only major details in which these amplifiers differ from one another, each amplifier having its transformer designed for maximum amplification over a definite range of wavelengths.

The ranges of these amplifiers are approximately as follows:

SE-1611	400	to	1000 meters
SE-1613	1000	to	3000 meters
SE-1615	3000	to	10000 meters
SE-1617	6000	to	20000 meters

In addition to the above series of amplifiers there have been several types of amplifiers designed for special applications. The most interesting of these is, perhaps, the SE-1493. This amplifier consists of 4 tubes and three radio-frequency transformers having a range of 400 to 1,000 meters. The last tube of the series acts as a detector. It is designed to meet the need for radio-frequency amplification of this range where audio-frequency amplification in the form of the SE-1600 is already available and requires no "audion control box" for its operation.

This covers in general the trend of Navy Receiver development and illustrates the variety of apparatus required to meet the growing need of the service for special designs and purposes. No attempt has been made to emphasize the tremendous efforts necessary to perfect each detail under pressure of war conditions but the results of the work well justified this careful development.

An Efficient and Flexible Receiving Set

By A. L. Groves

We all know that Mr. Groves has done some exceptionally good receiving work, and in this article he describes the set with which he does it, in such a manner that anyone may duplicate his results. Mr. Groves is an exponent of the "three-coil" circuit for short waves as well as long, but attention is particularly directed to the fact that for the reception of short waves the third coil is NOT a tickler, but instead forms the inductance for an Armstrong tuned-plate-circuit hook-up, a method which most of us have found superior to the tickler for amateur work. The diameter of the coils described by Mr. Groves was chosen after experimenting with every diameter from one inch to fifteen inches, and gave the best results. We are fortunate in having this pioneer work already done for us. This dope can be depended on.—Editor.

AS numerous amateurs have expressed a desire to know what kind of a set I use in obtaining results referred to in some of my previous articles in QST, I here present a full plan of my set, showing location of instrument, exact wiring methods, etc.

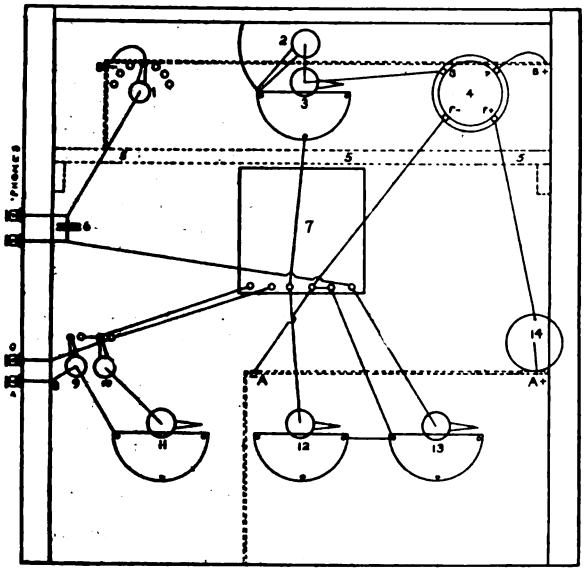
As will be noted, the set presents nothing radically new, unless we take into consideration the extreme simplicity of the whole layout, and this to a great extent accounts for the working efficiency of the set, for a set cannot work at greatest efficiency when hampered by unnecessary instruments and instruments placed on the panel in such a position that long leads and numerous crosses occur. The audion is a very sensitive instrument and every inch of unnecessary wire, every unnecessary switchpoint or other instrument, has its effect on it. These little things might not amount to very much taken separately, but collectively they amount to much, and no pains should be spared to have as few instruments as possible, wired with heavy wire as directly as possible.

Fig. 1 represents a set 20 by 20 inches front panel, and 10 inches deep. The depth may be only 8 inches, depending upon the size of A and B Batteries used.

The switches 1, 9 and 10 are one inch switch blades. Condensers 3 and 13 are Illinois 13 plate condensers. Condenser 12 may be either 13, 23, or 43 plate, depending upon the maximum wave desired to receive from, using the DeForest honeycomb coils. If the 13 plate condenser is used, waves up to and including that of WII (formerly NFF) on 13,600 meters may be tuned to. A 23-plate one will just about take in NSS on 16,900 meters,

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while the 43 plate one will tune to about 20,000 meters. DeForest claims 25,000, but if you get 20,000 you will do well. In fact, under actual working conditions all of the DeForest coils have lower minimum and maximum waves than those listed in their catalogue. Coil L-600 deviates from their figures to a greater extent than any other. They claim from 4,000 to 12,000 meters with it, while its working range is approximately 2,200 to 8,600 meters.



1. B. Battery Switch.
2. Variable Grid Leak.
3. Grid Condenser.
4. Audion Socket.
5. Shelf for B. Battery.
6. Fixed Condenser.
7. DeForest 3-Coil Mounting.
8. Aerial and Ground Connections.
9-10. Series-Parallel Switch.
11. Primary Condenser.
12. Secondary Condenser.
13. Plate Condenser.
14. Rheostat.

Dotted lines at top, B. Battery.
Dotted lines at bottom, A. Battery.

The primary condenser, 4, should have a maximum capacity of at least .0015 mfds. and may be either the DeForest, Clapp-Eastham balanced or other standard condensers designed for panel mounting.

Switches 9 and 10 throw the primary condenser in series with the aerial when both are thrown to the left as shown. If 9 is moved to the right, leaving 10 to the left the aerial is cut straight through and the condenser cut out. If both 9 and 10 are thrown to the right the condenser is connected in parallel to the primary coil. This simple arrangement will be found more efficient than the usual 4-blade 8-point switches used for this purpose.

The rheostat, 14, used by the writer is the Parkin, selected for its small size and simplicity.

The grid leak must be variable and is of the switch-lever-pencil-mark type.

Point 6 is the junction point of the plate circuit, stopping condenser, and receivers. The condenser used is the DeForest fixed condenser of .002 Mfds., and from this point a regular lamp cord is run to the point where it is desired to attach the receivers.

The coil mounting, 7, is the regular DeForest 3-coil mounting, preferably the ULC-400.

While the DeForest Honeycombs are excellent for long wave work, they are not suitable for best results on the short waves, and at the time of writing this article a new type of coil called the Duo-Lateral Coil has just made its appearance. I hardly believe these coils will prove any more efficient on short waves than the honeycombs, as I wound three coils of this type by hand back in April on 2¼-inch cylinders and while it was not expected that the hand-wound coils would show anything startling, a comparison between them and hand-wound honeycomb coils failed to show enough to warrant further experimenting with them, on the short waves at least.

For amateur waves, or we may say for waves below 600 meters, nothing brought out to date is more efficient (under actual working conditions) than the old time straight single layered coils.

The only previous objections to them was the inefficiency of the transformer, when made in the regular primary-secondary loose coupler style with its sliders and taps, dead-end effects and clumsy couplings, etc. The loose coupler had its day in the days of crystal detectors, but it has no place in the modern tube set of today.

Fortunately it is an easy matter to build coils of the correct size to fit the DeForest Mounting for short wave work, which are used in exactly the same manner as the regular coils, thereby doing away with the dead-end effects, taps, sliders, etc., and at the same time producing a most efficient set. A little experimenting by each individual to produce the exact number of turns in each coil is necessary, but once the correct values are determined the results obtained will more than pay you for the little trouble and care you have taken.

The best coils to use are composed of Bakelite tubing 5½ inches inside diameter with ⅛ inch wall, giving an outside diameter of 5¾ inches. ½-inch Bakelite sheeting is secured to make the bands on which to mount the coils on the regular DeForest

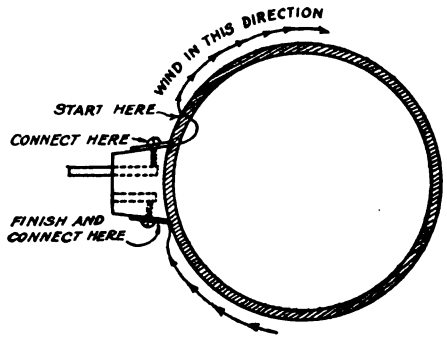
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Plugs, which can be taken from your unused DeForest shortwave coils.

The tubing is purchased in lengths ranging from 1 to 1½ inches wide if you wish to make the set from 200 to 600 meters from these coils, or if for short waves only, 200-300 meters, they may all be 1 inch wide.

20 turns of No. 22 SCC wire are wound on the first coil, which will give a minimum wave of approximately 200 meters when used in the secondary.

25 turns are wound on the next coil, and 30 on the next. These three coils will cover practically the entire amateur field



of waves with efficiency in the secondary circuit. In winding the coils it may be well to remember that on a cylinder of this size, 20 turns approximately equals 200 meters, 35 turns 300 meters, 50 turns 400 meters, 65 turns 500 meters, and 80 turns 600 meters, with the secondary condenser close around zero capacity. As the necessary number of turns increases, wider cylinders and finer wire are used. The 600 meter secondary requires the 1¼ inch cylinder wound with No. 30 SCC wire and this coil will give excellent results up to and including 800 meters. I leave it to the individual to wind as few or as many coils as desired.

For the plate coil, in most cases, one of the unused secondaries can be used. This depends somewhat upon the character of bulb used. The average Class 2 Marconi V.T., using three or four 22½ volt B Batteries requires a coil of 15 turns for the plate coil on 200 meters and one of 35 turns for 600 meters. In tuning on short waves it must be remembered the inductive feedback from the plate coil is undesirable; consequently the plate coil is swung wide open, as far as it will go and the plate coil tuning accomplished by the plate condenser thirteen.

The winding of the primary coil or coils will probably cause the average amateur the greatest difficulty, as no idea can be given here as to just what size these should be. Not less than 10 turns should be used. Most amateurs will be able to judge about what size to start on by the number of turns they already use for a given wave, then after a start is obtained the rest is easy. Perhaps the best plan would be to wind the coils for 10, 15, 20 25, 30 and 35 turns right at the start (6 coils in all); then you will be practically sure to have sufficient coils for primary secondary and plate for all the amateur waves. After these other coils are wound as needed and while this method may seem a little clumsy to some or too much work to others, I do not believe there has yet been brought out anything that will equal them under actual working conditions, and the advantage you have in working out the exact number of turns, size wire spacing, etc., for each coil to bring the set up exactly to your individual requirements is not to be overlooked and will in itself add much to the efficiency of the set.

The coils are all wound in the same direction and with as large size wire as the number of turns necessary on a certain width cylinder will allow. They are held facing you as in Fig. 2 The wire is started on the side towards you and wound to the right. After the correct number of turns have been wound on, and the end of wire made fast, it is mounted on the plug by the Bakelite band in the regular DeForest manner, care being taken that in all coils the end of wire where you started winding is connected to the plug and the last end of wire where you stopped is connected to the socket. This can be conveniently done by simply bringing the ends of wire to the metal plate and screw which holds the Bakelite band, as these screws connect firmly to the plug and socket, respectively.

After the correct sizes have been determined the leads may be soldered to the plugs in the regular manner if desired.

Be very careful to wind all coils in the same direction and to connect to the plug in the same manner.

Using a set exactly as described, amateur signals are being received on a 30 foot aerial the first week in July in twilight at distances ranging from 125 to 200 miles with an average audibility loud enough to be heard with the receiver held at arm length, while many are loud enough to be heard over the entire room. Only a single Mrconi Class 2 bulb is used.

(Editor's Note: Mr. Groves is now using a filament hot-wire ammeter, with a two-point switch in the filament circuit not shown. The switch cuts on and off the filament current once the rheostat is properly adjusted, and also turns it through the ammeter when desired, saving the meter and the drain on the battery when the meter is not desired.)

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The New York Radio Central Station

Super Powered Radio Station To Be Erected By The Radio Corporation of America

FOR more than two decades the wonders of wireless have so unceasingly intrigued the public imagination that it would appear little remained to be accomplished in developments of revolutionary character. Yet, once again, it is disclosed that a startling conception in wireless communication has been quietly brought to a point of realization. On the north shore of Long Island, near New York, the Radio Corporation of America is about to begin construction of a super-powered radio station that will simultaneously send to and receive messages from five nations of other continents.



The new and great medium of far-reaching economic and political influence will bear the name of New York Radio Central Station, the steel towers of which will arise on a 6,400-acre tract, comprising nearly ten square miles of land lying east of Port Jefferson, with a long frontage on Long Island Sound. The preliminary engineering studies have been completed, contracts for all the construction material are being let, and the J. G. White Engineering Co. is immediately taking the big job in hand.

There will be five complete transmitters, each one a duplex unit with a corresponding receiving station located nearby. All five transmitters and the five receivers will operate simultaneously and will transmit and receive messages continuously during day and night. As soon as the station is completed, immediate message service will be established with France and Germany to supplement the existing commercial circuits; ultimately, radio from this station will connect up Buenos Aires and other points in South America, and two-way communication will be established with Poland, Sweden, Italy, Denmark and other European countries. It is a plant that dwarfs all existing wireless stations into insignificance; a single unit will have power and range the equivalent of the largest wireless stations in the world today, and all the units may be operated in multiple if desired.

The form of aerial construction is a new departure using the Alexanderson multiple-tuned system. From the central power house six aerial spans will radiate out in a star pattern, to a distance of more than one mile from the center. This huge antenna will be carried on self-supporting steel towers, each 400 feet in height, with the wires suspended at the top between 150-foot across arms. Each of the six T-antennae will have twelve towers, forming, so to speak, the spokes of a giant wheel fashioned out of seventy-two miniature re-

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plicas of the famous Eiffel Tower in France. Five of these antennae will be used for regular service while the sixth is reserved for emergency operation.

The apparatus and system which will be installed for each of the five units will be the same as that at present in the New Brunswick station. Every exacting requirement of commercial radio message service will be satisfied in the apparatus of circuits with which the station will be equipped. The generation of the energy will be effected by Alexanderson alternators constructed by the General Electric Company. This machine is the concrete expression of an ideal which electrical engineers have held for many years, for it represents a perfected generator of high frequency electrical oscillations constructed along the lines of the ordinary power house dynamo. The problems solved by Alexanderson, chief engineer of the Radio Corporation, were thought insurmountable. Because the transmission of radio signals requires alternating currents of frequencies a thousand times or more in excess of those used in power engineering, it was considered beyond the range of practicability to obtain such currents from a dynamo. In the Alexanderson alternator equipment, the new station will have a source of energy as reliable as the power dynamo, yet creating a steady stream of electromagnetic oscillations. So efficient and reliable has the Alexanderson 200-kilowatt alternator installed at New Brunswick proven itself, that leading radio experts of Europe have made special trips of investigation to the United States to view its performance; now this already famous single machine is to be duplicated and installed in the New York Radio Central Station; but this time there will be two 200-kilowatt machines for each transmitting station—ten in all. The achievement, from a radio engineering standpoint has nothing approaching a parallel: ten alternators, 2000-kilowatts, 3000 horse power—an astounding force to concentrate in realization of a dream to transmit messages over the world to all points of the compass from a single source!

A great saving in power is effected by the use of the Alexanderson multiple-tuned antenna. In fact, for the same power input formerly used for a single station, six times the effectiveness at a distance is obtained. In other words the same effect at a distance with 200-kilowatts input is obtained as would be obtained from the old type of antenna with 1200-kilowatts input. This new type of antenna is the equivalent of six independent radiators, all operating in unison at the same wave length, and for the complete station with its five antennae units, the power required will be less than 20 per cent. of that formerly necessary. The project however, contemplates additional possibilities. To illustrate: in many cases, but one-half of a single spoke of the antenna system may be utilized for communication service to a certain point. On this basis the Long Island Station will ultimately permit simultaneous transmissions to a maximum number of ten points in the world, thus doubling the communication facilities originally planned.

The receiving aerials are of a new type, designed for operation with the improved Weagant system of stray elimination, which, by a combination of opposed electrical circuits, nullifies the effects of atmospheric electricity and makes possible uninterrupted reception from foreign countries under all weather conditions. We understand the Weagant system has been greatly improved since its announcement, and that Dr. Alexanderson has chosen it as the best available circuit for this work. The receiving units are located only eighteen miles from the multiplex transmitting equipment, instead of following the former practice of establishing one transmitter and one receiver in one locality and restricting the service of the circuit to one overseas destination.

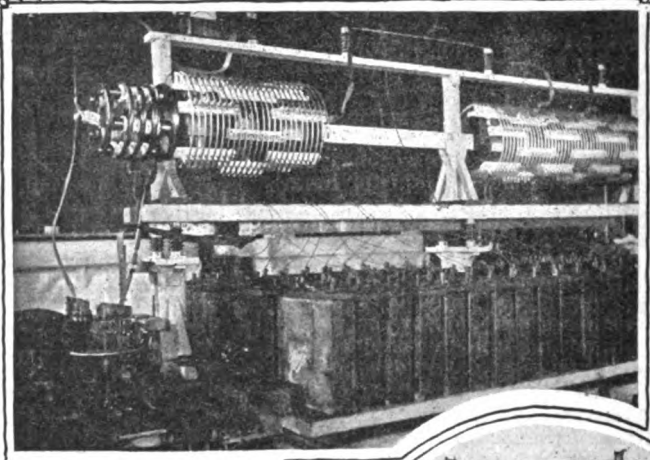
The arrangements for distant control of the New York Radio Central Station follow the same policy of concentration. In Broad Street, the heart of New York's financial district, the company's public telegraph office is being re-equipped to handle the new station's traffic along with the radiograms which are now received for England, Norway, Hawaii and Japan. Thus messages for any of the five additional countries reached by the new station will be received in the New York City office and dispatched direct from a series of operators' keys and relays which will operate the transmitting apparatus out on Long Island. Messages from overseas will ultimately be received in the same manner, receipt and delivery of the actual messages being effected by the customary messenger boy service direct to the home or office of the patron.

It is expected eventually to install apparatus for high speed transmission and reception, photographic tape recording being used for the latter. This will be under the supervision of a trained staff of operators, along with which there will be the usual staff of expert Morse operators, who will work those circuits over which high speed transmissions is not taking place.

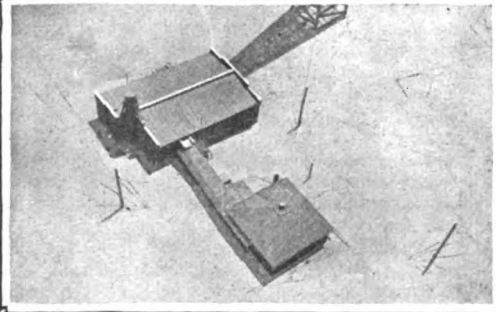
Countless details of technical interest and engineering importance are embraced in the specifications for the station, due to the combined personnel of the Radio Corporation and the General Electric Company, an arrangement made possible by the recent merger effected by these interests and the absorption of the Marconi Wireless Telegraph Company of America.

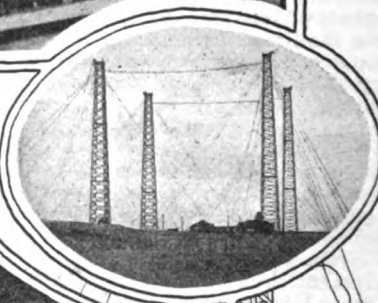
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Old "WCC" Cape Cod



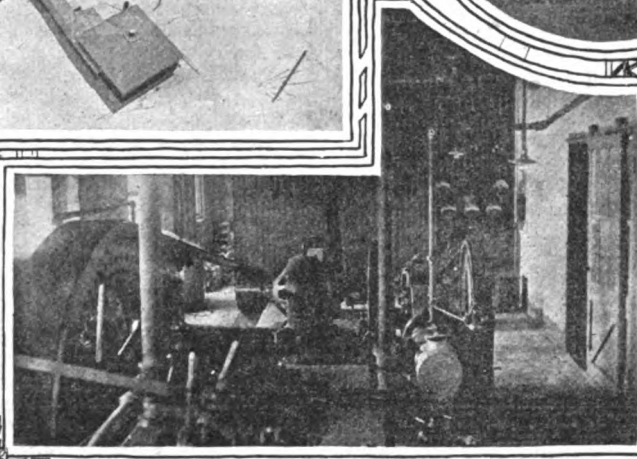
GENERAL VIEW OF THE OSCILLATORY CIRCUITS





THE FOUR WOODEN TOWERS

LOOKING DOWN ON THE POWER HOUSE & RADIO ROOM FROM THE TOP OF ONE OF THE TOWERS



THE POWER-HOUSE INTERIOR



THE SPARK-GAP PHOTOGRAPHED BY ITS OWN LIGHT

H R. HICK

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Old "WCC," Cape Cod

By "An Old Timer"

MANY will remember the low note of Marconi's old South Wellfleet station which is now but history, the station having been torn down and nothing but the sands of Cape Cod remaining to tell of the radio days of the famous old station.

The several photographs will give an idea of the station and the equipment of the times before the war. There were four wooden towers 200 feet high, set at the corners of a square about 300 feet on a side, with the power house and radio room in the center of the square. Instead of a ground a counterpoise of wires on poles about fifteen feet above the earth was used. Transmission was by Wheatstone tape or hand, at will. In the engine room was a 50 h. p. oil engine belted to a Westinghouse alternator, 60 cycles, 1100 volts, a small D. C. generator for excitation and to charge the storage battery; and the two transformers which stepped the voltage up to 22,000. An unusual feature of the station was that the key, instead of breaking the primary circuit, broke this high-tension circuit. From the transformers the current passed through two air-core chokes to the high tension room, then through oil chokes, to the automatic key, which had blowers to quench the arc, thence to air chokes, and on to the condenser, gap, and oscillation transformer.

There was a Western Union office at this station and the traffic was received in the day and punched on a tape, and at 9:30 P. M. we would start to send, stopping every fifteen minutes for five minutes. At the end of the schedule we would wait fifteen minutes and then repeat until we had run the tape three times. When traffic was heavy it would take us until nearly daylight to finish. On a clear cold night the writer has heard the spark while walking on the beach five miles from the station.

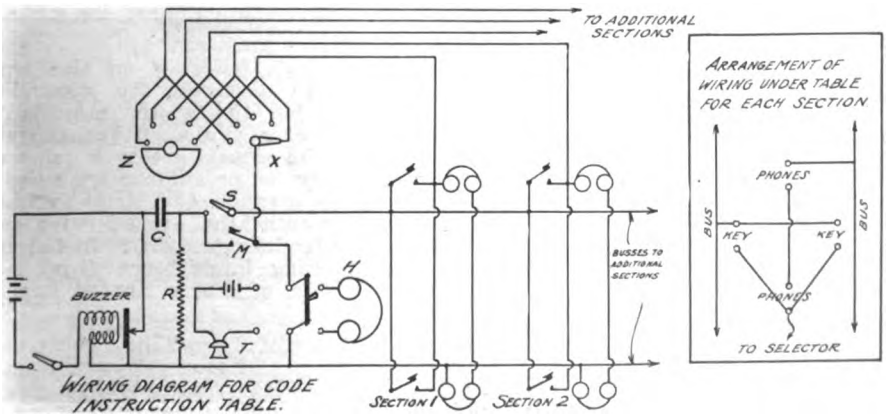
Farewell to old WCC is the wish of
ONE OF ITS OLD MANAGERS.

(In an early issue we will have a similar story on old SA of 1904, the early Naval station in Puerto Rico.—Ed.)

Code Instruction Tables

SEVERAL of the Affiliated Clubs have asked for a wiring diagram for a good code-practice table. We present here a most ingenious and versatile hook-up, devised at one of the flying fields during the war and adopted as a standard at Air Service schools.

In this circuit the buzzer or other source of musical frequency is permitted to operate continuously, the keys controlling merely the connection to the head-sets. All the apparatus shown at the left-hand side of the diagram is located at the head of the table, where sits the instructor. C is a 1 mfd. paper condenser, for insulation purposes. R is an adjustable resistance for controlling the strength of the signals, and may consist of three 500-ohm carbon



WIRING DIAGRAM FOR CODE INSTRUCTION TABLE.

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rods in series, with means for cutting out one or more. Switch S controls the continuous note to the bus lines, M is the master key H the instructor's head-set, and T a microphone and battery for speech when necessary. The remainder of the table is divided into sections, preferably by wood rails about three inches high, and each section consists of apparatus for two students, who sit facing each other and whose apparatus is interconnected. From each section another wire runs back to the instructor's table and is connected to a point on each of two switches, one X, a selector switch, and the other Z, a short-circuiting switch, the rotary member of which consists of semi-circle of metal capable of shorting all the points when revolved.

In operation, the switch Z is turned to short-circuit all these leads, switch S opened, and the instructor may then transmit to the whole table by means of the key M, the keys in the individual sections being out of the circuit. Opening switch Z and closing switch S, the circuit is so arranged that the two students in each section may have inter-communication, without interference with other sections. Furthermore, by manipulating the switch X, the instructor may listen in on the work of any section, and correct errors or give advice by switching in his microphone, all without disturbing the work of the other sections.

The insert in the figure shows the wiring necessary for each section, and will be seen to be extremely simple.

This circuit works excellently, and the advantage of providing inter-communication between many groups of students with individual instruction, as well as the simpler problem of transmission by the instructor to the whole table, can not be overestimated. If desired, one or two additional transmitting units can be connected in parallel across the busses, tuned to different pitches, and operated by assistant instructors. This will give practice in reading thru interference which is of the highest value and will render a most life-like imitation of the condition of the "air" on 200 meters on an average night.

SOME CHARACTERISTICS OF THE UNDERGROUND SYSTEM

"The underground system for long wave reception, using optimum length wires, gives roughly the same signal strength as an average 100-foot antenna; while for short wave lengths the signal strength is a function of the wave length, and it may be said that the shorter the wave length, the weaker the signal. This may be attributed to the skin effect of radio frequency current with reference to the penetrating qualities of such current thru a partial conductor. For a wave length of 600 meters, the signal strength as received by the underground system, is approximately one-twelfth as strong as a signal received with the overhead antenna. For efficient reception on short wave lengths, it requires an amplifier using three stages of radio-frequency, which gives a signal that is approximately of the same strength as that of a signal received on the overhead antenna unamplified. * * * *

"The underground system has excellent directional qualities. Using two wires in the direction of the transmitting station, the maximum signal is obtained; while using two wires which lie in a direction which is at right angles to the transmitting station, the minimum signal is obtained, and in many cases is not heard. It is possible that the operator on watch can, at any time, ascertain the approximate direction from which the signals are coming by means of using various combinations of wires. A good stand-by tune, by which the operator can hear all stations, is obtained by the use of two wires at right angles to each other, namely an east-and-north combination, and so on. * *

"It is very essential in this system that all wires be perfectly insulated; wires that are grounded bring in more strays altho when wires have been perfectly grounded, the stray ratio is still equal to and often better than that of the regular antenna. However, to obtain the best results from the system, the wires should be clear of all grounds. * * * * *

"For short wave lengths it is highly essential that the optimum length of wire for each wave length be used. Altho by means of high amplification the proper signal strength may be obtained, for efficient results the optimum length should be used. * * * * *

"There is a tendency on the part of operators to disparage the ground wire system during the winter months when strays are at a minimum, because of the fact that the signals are so much weaker than they are on an antenna with the same degree of amplification, but during the summer months the ground wire system demonstrates its superiority. In the matter of eliminating interference from nearby stations it is, of course, always superior."

Abstracts from "The Use of Ground Wires at Remote Control Stations," by A. Hoyt Taylor and A. Crossley, Proc. I. R. E., June, 1920.

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A New Type of Variable

THE Connecticut Telephone & Electric Co. have produced a condenser which is entirely different from anything now on the market, both in design and in results obtained in operation.

This is a very convenient instrument, being extremely compact, stable and free from mechanical fluctuations, of very low effective resistance, and simple in design. Figure 1 illustrates the construction, an exterior view of the condenser being shown elsewhere in this issue.

It consists essentially of two plates, B and D. B is fixed, and not only forms one plate of the condenser, but at the same time is a support for the entire unit. The plate D is free to move to and from B. The surface of B is covered by a thin washer of mica C, and the plate D has secured to its underside a block of insulating material which supports the guide rod and the screw. This guide is slotted at either end and passes over pins. This latter arrangement prevents the plate D from rotating when the nut is screwed down upon the shaft. A spring placed upon the screw operates to open the plates when the nut is unscrewed on the shaft. The variation of capacity, then, is obtained by merely screwing the nut upwards and downwards upon the shaft, which moves the plate D to and from B. The thread on this shaft is selected, however, so that the entire range of capacity is secured by one turn of the nut, although the scale may be loosened and secured in some other preferred position.

The outside dimensions of the Connecticut condenser are 2⅞" diameter and 1⅝" height to the dial, the required capacity being obtained within this small space by the use of an extremely thin dielectric—a sheet of mica .0005" thick—for the upper values; while, on the other hand, the presence of the mica, when the plates are considerably separated, hardly affects the capacity, the air dielectric then being the main factor. The result is that this condenser has a very high capacity at the upper end of the scale, and a correspondingly low capacity at the lower end, the whole being distributed over a scale length of 360 degrees. Fig. 2 is a typical calibration curve, in which this effect is clearly shown. The presence of the mica becomes evident only at the upper end of the scale, the sharp upward bend of the curve being caused by it. At any adjustment capacity is inversely proportional to

$$\frac{M}{K} + A,$$

where M is the thickness of the mica, K the dielectric constant of the mica, and A the distance from the outer surface of the mica to the movable plate.

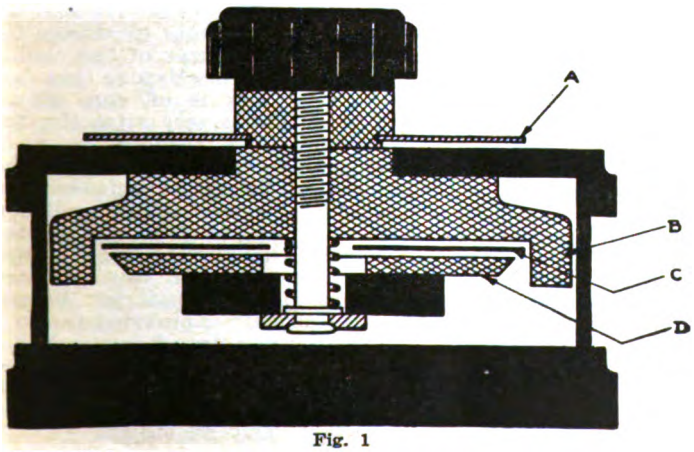


Fig. 1

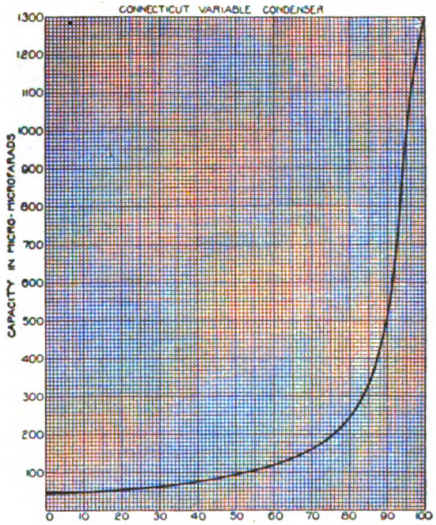


Fig. 2

A BOARDWALK ROLLER-CHAIR RADIOPHONE

One can now find a genuine radio novelty on the boardwalk at the famous seashore resort, Asbury Park, N. J. Great excitement was caused recently when a roller chair containing three passengers and a wireless telephone and telegraph receiving apparatus made its appearance on the boardwalk.



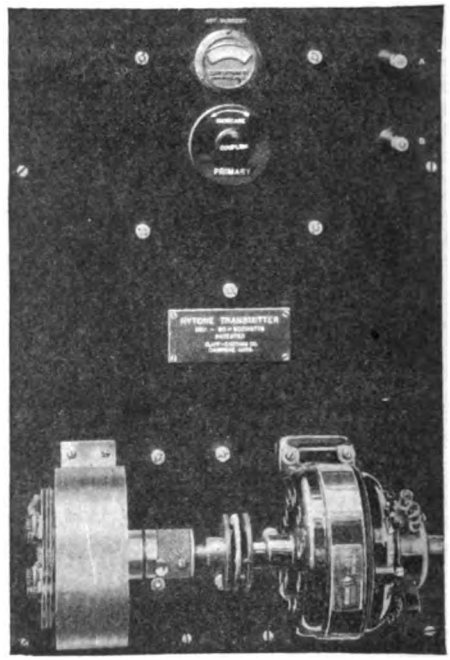
As can be seen from the picture, the passengers are thoroughly enjoying this innovation introduced by W. Harold Warren, who some time ago demonstrated that it is possible to receive wireless telephone and telegraph signals within a steel and concrete bank vault with both inner and outer doors closed and with no external connections with the receiving apparatus. This equipment now makes it possible for a man to enjoy himself in a wheel chair on the Asbury Park boardwalk and at the same time have his New York office talk to him by radiophone or for his wife to get a land line connection with the New York radiophone station and say "Where are you, John?"

The apparatus is very compact and consists of a loop, a detector, and an amplifier. The loop is of the flat type and measures eighteen inches on each side. The cross supports and protecting frame are made of white pine lattice ¼-inch thick by 1¼ or 1½ inches wide. Each of the cross supports is 25½" long. Commencing 3½ inches from the center, saw cuts ½-inch apart are made on both edges on each of the four legs, in which No. 26 S. C. C. wire is tightly wound, making a double web. Leads are taken from the ends to the detector circuit. No coils are used, tuning being accomplished solely with the variable condenser. There are 18 turns on each side of the loop and approximately 90 feet of wire is used. This size of loop is most effective for wave lengths from 300 to 500 meters, but good results have been obtained on wavelengths up to 800 meters.

CLAPP-EASTHAM 1-2 KILOWATT HYTONE TRANSMITTING PANEL

The demand for an amateur spark transmitting panel at a moderate price was taken into consideration when this set was designed.

The instruments are mounted on a half-inch Bakelite panel 16" x 24". The panel is suitably engraved, and high tension binding posts are mounted in the upper right hand corner for antenna and ground connection. The Hytone rotary quenched gap



and motor are mounted on the front of the panel, as well as the knobs to change the coupling and primary turns of the oscillation transformer. The Hytone gap has been redesigned and is of cast aluminum, which provides a very attractive finish when machined.

In the rear of the panel are mounted the transformer, Dubilier mica condenser, and oscillation transformer. The oscillation transformer is constructed entirely of Bakelite and nickel-plated copper strip. Three are five turns in the primary and ten turns in the secondary. Adjustment of the secondary is provided for by a clip. All connections are of copper braid, which provides against undue resistance and loss of efficiency. With an antenna of 10 ohms resistance, this set is said to be capable of over 5 amperes output.

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The Ultimate Receptor

THERE are too many thuminjigs, dingwhackers, and rettysnitches on a modern amateur receiving set. With all the various features to adjust, it takes too much precious relay time to shift from one wave to another, however slightly removed, and again secure the optimum adjustment all around. On an average set there are at least four adjustments to be made, and there may be seven or eight. Too many. Life is fleeting and we need improvement to better present consumption of "man-hours-per-message", as our grouchy friend, The Old Man, puts it.

Understand us, we do not wish for a minute to disparage the splendid tuned-plate-circuit regenerative tuners we have now. They are the best receiving sets we have ever had and our present good work is largely possible because of them. But can't our manufacturers whittle down the number of necessary adjustments and retain the good features of selectivity and high regeneration and so increase their value in relay work?

For a long time we've had in our mind's eye a picture of this Ultimate Receptor. A compact cabinet; a panel with just two large easy-turning knobs; one marked "Tuning" and arranged for calibration in wave lengths; the other to control "Regeneration". Wouldn't it be a great time-saver! Why, it takes a man a season to learn how to get the most out of our present sets, and it takes an expert a half minute to make a shift of wave length and get all the variable elements in their optimum adjustment again. Consider the set we have in mind. One element would control the tuning; properly tuned, there would remain only to adjust the regeneration to the critical value. (We are sure the regenerative feature is vital and must never be dropped, and that it is not possible to satisfactorily combine it with the frequency-adjusting member.)

Now for the principles—what shall they be? There is the single-tuned-circuit arrangement, a relic of the single-slide tuner days, and those who worked with the small Western Electric telephone sets during the war know that they performed well. But they do not very well lend themselves to regeneration, nor do they seem selective enough. Mr. R. E. Thompson has recently patented a mono-control arrangement for commercial ranges which employs (with a crystal detector) a secondary inductance whose winding is so widely spaced that the distributed capacity is to all practical intents nil. Such a circuit, then, should act with true aperiodicity, make feasible a fixed coupling of such magnitude that the transfer of energy would be efficient and almost without reaction, and, it seems to us, should be capable of satisfactory regeneration when used with an audion detector—particularly since the range of wave lengths may be quite small. With the aerial circuit range adjustable by a variometer or series condenser, we would have it.

Something along this line is needed. Can't we have it, Mr. Manufacturer? The first man that comes along with it will gather in the berries.

The Great American Noise-Maker

SURE, you guessed it—we mean the spark coil, the poor, sadly abused squeak box. But if you think this is another knock at that long-suffering piece of equipment, you are wrong. We've been accused of that too often. A certain man who owns a spark coil because he can't get alternating juice and who thinks we are unjustly hard on the coils, nearly beat us up recently over just that.

It isn't the coils themselves. They are perfectly respectable in proper hands, and although their potentialities in hands of other types give us the wooly willies we have all beheld the tragedy of a "rich" ham bursting into the game with a shiny new kilowatt transformer, and not a man of us but knows that he will cause X times as much clatter as any coil set in existence, the factor X being a number with seventeen more ciphers on it than our printer owns.

This must be admitted in common justice. It is because the coil is cheap and hence the starting equipment of so many

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beginners who are nightly a source of provocation, that it has been brought into the Night Court. Very often when we sit trying to find a hole in the smother it is these gentry who are mutilating the air with flivver-boxes, and generally by the time an amateur reaches the "transformer stage" he has progressed to the point where he does not impose upon the rights of others. The result is that generally we see only the trouble the coilers make.

Now the Editor started out these many years ago with a gas engine coil, and he didn't know the code, and he hadn't heard of law and order in amateur affairs, and he had no idea how much racket he was making. So we know just how the game goes, and it seems to us, fellows, that condemnation is not our proper attitude towards the offending operators of spark coils. Thank your particular lucky-piece that it isn't a kilowatt, and go help your friend of the broomstick tuner and potato detector to get better. He probably knows much more than you did when you'd been in the game only that long, and he is the very material from which star A.R.R.L. stations are eventually made. Now that the hot weather is on and some of us DX men haven't much to do, why not give some time to visiting these coil stations, see what they have, and help them to get the best results out of their sets. That means adjusting the coils to a good clear tone and a good sharp tune, which will give them their best range and yet minimize their disturbance.

And haven't you realized that if these Juniors in the game only could hear the things you do, there would be more co-operation? We know one city where the local club made up a bunch of regenerative receivers and audion panels and sold them at cost—a very low figure—to the J.O.'s. The result was almost miraculous. Where bedlam had reigned supreme, all was as it should be. The beginners found that the older men were willing to help them, they could hear what the older men heard, co-operation entered too, and there was much less temptation to pound the key just to stir up something to listen to.

Here's another idea. Take these coil men out to your station, one at a time, set them down at the key, and tell them to go to it. Most of the time they haven't any idea what you are nightly up against but listening in on your set will show them. Let them start working somebody and then have a squeak box start nearby with the typical display of superflous signals, adjusting the vibrator, useless talk at one word per minute, and a wave as broad as Texas. A sense of appreciation will dawn on them.

Remember, their right to the air is as inviolable as ours. The situation demands co-operation. "Tolerance", as the Old Man says—tolerance, and education. Give the boxers a lift—it will pay.

Club Affiliations

EVERY month sees an increase in the number of stable organizations affiliated with the A.R.R.L. In this way we are building up a fine structure that will stand the amateur in good stead whenever any matter arises that requires concerted effort for its conclusion.

These are the live-wire clubs, the far-seeing clubs, who are interested in the handling of relay traffic and who perceive the value of organization for all things. Let us repeat that in affiliating with the A.R.R.L. a society in nowise loses its independence or merges its identity. The A.R.R.L. does not seek that. Our sole aim is the creation of a complete fabric covering the amateur world, whereby, through co-operative effort, we may always enjoy the pursuit of citizen radio, progress in knowledge, and increase the efficacy of our traffic handling. The bond is a moral one—as it properly should be.

Clubs, if you think as the A.R.R.L. thinks on matters concerning the amateur, communicate with us on the subject of affiliation.

Radio Jobs

THE current issue of "Electrical Merchandising", a magazine devoted to the retail electrical supply trade, contains several articles pointing out to electrical jobbers and dealers the value of stocking a line of radio apparatus and cashing in on the ever-increasing demand for supplies and equipment. Most of these articles stress the importance of securing the services of a live young amateur to head the new department. The A.R.R.L. has them.

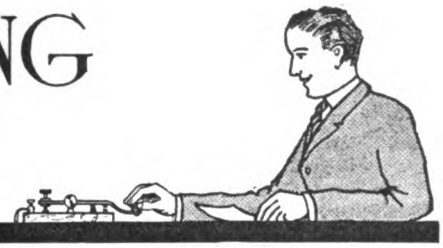
It looks to us like there is going to be a good demand for radio salesmen with enough executive ability to take hold of such a proposition and make a go of it. He'll have to be a business man, or he can get nowhere; and, just equally as important, he must know his radio in order that he may give sound advice to customers. The peculiar combination of these two qualities is worth money in the radio business today, and we believe that those inclined that way can with profit prepare themselves for some good positions in work that never grows uninteresting.



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THE OPERATING DEPARTMENT

J. O. SMITH
Rockville Centre, L. I.
TRAFFIC MANAGER.



REPORTS from several of the Divisions have not been received this month up to press-time. Although indications are that business there is much as usual and the failure to render reports is probably due to the fact that this is the height of the vacation season, it is very desirable that we have accounts of the divisional progress as usual.

In the past month the effect of strays has been felt to a considerably greater degree than heretofore this summer, and is reflected in the reports. At that, however, the volume of traffic handled seems to be in the neighborhood of fifty per cent. of the winter normal, and this is considered a splendid showing in view of the fact that this is the first summer in which we have made a really determined effort to keep routes open and things moving. With the experience gained this summer, and the technical improvements which will doubtless occur, we feel that there will never again be occasion for slackening relay activities in the summer months.

Traffic is being handled with absolute ease over territories where daylight routes are in operation, and the Traffic Manager wishes to again bring to the attention of the personnel the desirability of formulating short-jump routes with the stations within daylight range of each other. Station owners who are persevering in their operation through these months are finding the game well worth while, with only the long distance stations cut off from them, and with the increasing perfection of our routes, the summer handling of traffic is gradually reaching the efficiency of winter operation over the whole country.

Reports from the Division Manager follow:

PACIFIC DIVISION
A. E. Bessey, Manager

The situation for the summer is pretty bad, although we are keeping the routes open much better than any other summer before. The Bay district is all going fine and the stations are getting tuned up in great shape, more amateurs than ever doing long distance work, even under the adverse condition of the summer QRN. The routings through the north and south are only reliable through 6EJ, who is keeping his hands full handling the relay work. He certainly has a wonderful location, as he is still going strong both north and south and is practically the only reliable route either way. At this particular time a good many of the stations are taking their vacations and there is not much work being done. There have been some tests made with 7CU, which worked very satisfactorily. We have a few new stations that are coming into prominence now. 6BJ of Burlington who is burning the air for fair, and promises to be a wonderful long distance station. He is heard in San Diego very QSA. The southern amateurs are heard here occasionally but are not at all reliable. 6AB of Healdsburg is doing nice work. 6OH of Ukiah is also doing splendid work. His spark is heard all over. The Bay section hears 6JI very good but up to the present time have not heard of any one working him.

We have this month a report from A. E. Banks, 6IY, of San Diego, which we have long wanted as we have been unable to get any report from San Diego lately. The last month has witnessed an aggravating increase in QRN which together with QRM from an almost constant arc and high power spark has made long distance work difficult. Communication has been carried on, however, with Los Angeles, Long Beach, Laguna Beach, and Del Mar, and a good number of messages have been relayed through stations 6JD, 6EM, 6SK, 6IF and 6MZ by our local operators. The following stations are using from one to two step amplifiers and are competent to handle traffic in San Diego: 6XZ, 6JI, 6TW, 6IZ, 6IY, 6MZ.

While northern stations are very QSA at all times it has been difficult to get answers from them, the reason no doubt being local QRM. This has been the case particularly with the Los Angeles stations and it is understood that the interference in that city has increased to such an extent that traffic has been steadily interfered with. It is believed that if some earnest individual made a survey of some of the high powered spark stations as well as the arc with a 200 meter wave meter he would be able to suggest grounding certain un-

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grounded guy wires, etc., which are causing disturbances among amateur circles. There seems no reason for such an abundance of harmonics unless something such as the above is needed.

6EJ of Walnut Grove reports: A new member was added to the route here, a Mr. Adams of Stockton, 6KM, who joined the ARRL, thus giving us a member in Stockton who has a capable spark. 6GR of Sacramento has been successful in long distance work this month, clearing 7CU on several occasions. 6EJ and 6AK are clearing both north and south including Fresno, very well. All local routes in good order.

6DP of Santa Cruz reports route open to the south and has worked many of the Bay County stations. The boys in Santa Cruz are all getting nicely equipped and will soon be on the job for relay work. A. L. Munzig, of Redlands, Calif., is just securing a special license and we feel sure that this will open up the southern route so that we will be able to work through very nicely. He is an old timer and a commercial man so that he will have no difficulty in handling traffic.

There is a great wave of club organization at the present time which we feel sure will make it very interesting for winter work. All the Clubs seem very favorable towards affiliating with the ARRL and as soon as we get banded together and start working for a common interest believe that we will have better co-operation on relay work.

WEST GULF DIVISION
F. M. Corlett, Manager

Radio activities throughout this division, as far as relay work is concerned, seem to be pretty much at a standstill. Old Man Static is right on the job with both feet and usually keeps a brick or two on his key to be sure that we don't handle anything.

District Superintendent White of Northern Texas and Tilley of Southern Texas have been endeavoring to work out a daytime schedule for Trunk Line "F" in order to keep it open all summer; some tests were run and all indications were that it would be an easy matter to handle traffic with ease IF the Stations IN LINE COULD BE DEPENDED UPON TO BE ON THE JOB ON SCHEDULE.

District Superintendent White, of Northern Texas District is spending his honeymoon in Colorado but sends in a brief report. He expects to be back in Texas shortly and invites correspondence from prospective as well as station owners. Address him at District Headquarters, Box 322, Ennis, Texas. He reports some ten stations under construction in the upper Panhandle of Texas. These stations will help us on our swing westward next winter. Why not get lined up for some day-light tests NOW, as soon as the stations are ready, and see if we can't work WEST this Summer? Assistant District Superintendent Martin, of Amarillo, is doing some good work along the organization line, a club is being organized in Amarillo and it really seems that our dreams of an amateur radio station in the Texas Panhandle to help bridge some long jumps west will soon be a reality.

The Waco Hertzian Society has secured permanent meeting places at Hills Business College, and a club station will be erected there. In a recent parade in Waco the A. R. R. L. as well as the Waco Club was represented by an elaborately decorated automobile which created much interest amog the spectators.

District Superintendent Tilley, of Southern Texas District, has a rather meager report to make. Radio in his district is about dead for the Summer it seems. A number of stations are taking advantage of the lull and are putting their stations up in first class condition. Tilley, 5ZU, is rebuilding his antenna system, putting in 70' masts; other improvements are a quenched gap, regenerative receiver, and an elaborate ground system. You fellows with good stations in Southern Texas get in touch with Tilley and let's see if a daylight schedule can not be arranged.

District Superintendent of New Mexico, Louis Falconi, is evidently so busy getting all fixed up for the coming season that we very seldom hear from him by mail and of course the jump is entirely too long to hear from him by radio. We understand that all that good receiving work he was doing last winter was on a straight loose-coupler and a couple of "lamps" and that he is now putting in a regenerative receiver and all the fixings. We wonder what he will do this winter. Let us hear from you, Falconi.

No further developments in the Oklahoma District as yet.

ATLANTIC DIVISION
Chas. A. Service, Jr., Manager

Hot weather has brought most of the relay work to a standstill in this Division with the exception of daylight routes in operation between some of the larger cities. QRN is so intense most of the time that there is no chance of getting MSG traffic through except by the short jump method, although DX stations may be heard and worked on the few favorable nights with surprising ease, considering the time of year.

The Bureau of Standards QSS tests continue to hold the interest of the amateurs and by the time this report is published the A.R.R.L. Division tests of a similar nature

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will be in full swing and, it is hoped, will be as successful. The Division Manager urges all amateurs capable of receiving these tests regularly to send in results as requested in the June and July issues of QST.

We note that the Navy Department is taking a greater interest in amateurs as indicated by the QST's which the various Navy Stations are sending for the benefit of the amateurs in New York, Philadelphia, the West Coast and elsewhere. The Navy realizes there is undoubtedly a good field for recruiting radio operators in this way and at the same time, to promote friendly feeling on both sides and a consequent cutting down of amateur QRM on the higher tunes.

The Division Manager has an accurately calibrated receiving set and has made measurements of local and long distance amateurs in his Division during the spring and early summer months and has found there is a universal tendency everywhere to cut down wave length within legal limits, and to pay some attention to decrement. This may be attributed to several causes:

1. The higher degree of skill and technical knowledge of the general amateur world.

2. The use of wave meters and the influence of A.R.R.L. and local associations' propaganda and assistance to junior members.

3. The knowledge that long distance work can be done on 200 meters with proper adjustments of transmitters and the use of amplifiers at receiving stations.

This is fine business and should be continued.

Reports from different sections of the Division are as follows:

Mr. Hornung, District Superintendent for New York, reports that the Y. M. C. A. Radio Club has been keeping a continuous watch and has been copying the QSS signals sent by the Bureau of Standards. New life has been injected into the Y. M. C. A. Radio Club. They are now printing a two-page semi-monthly bulletin called the Loud Speaker. In addition to this, they also have formed a free code and theory class for club members. Clubs throughout the country should take this movement up and help the ARRL by becoming affiliated. Traffic in and around New York has been pretty dull, due to excessive QRM and QRN.

Mr. Goette, District Superintendent for Brooklyn also reports that traffic has fallen off due to the coming summer season; very little western traffic is coming through. It is impossible, due to heavy static, to work any distant 3rd or 8th district stations.

The Radio Traffic Association of Brooklyn closed their last meeting of the season with a membership just falling short a trifle under one hundred members. The first meeting of next season will be held in October.

According to advice received from the Bureau of Stndards, the fading tests, so far, have been very successful. These tests are now known throughout this district and very little interference is being experienced from stations other than the official transmitters. As yet, Station 9LC has not been heard but the others have been coming through very good.

Mr. Spangenberg reports very little traffic in Northern New Jersey.

2QR (Robinson Bros. of Keyport, N. J.,) has just been assigned to the traffic department of the ARRL. Mr. Frye has just appointed Mr. H. J. Hemphill 3DT as an official ARRL station in Atlantic City.

A peculiar condition exists between certain shore stations in Atlantic City and vicinity, it being possible to get daylight signals from stations on Long Island and New York vicinity. This is very encouraging and may result in a daylight route from New York to Philadelphia and vicinity. With the help of Mr. Smith (2ZL) and several others, a series of tests will be arranged in view of completing this route.

A series of tests have been carried on between Mr. R. C. Ehrhardt (8CE) near Scranton, Pa., and the station of the District Superintendent in an endeavor to connect Scranton with Philadelphia and vicinity. It is hoped that such a connection will be made in the near future although very little consistent traffic work has been done to date.

Stations which deserve the credit for having carried on the bulk of the traffic during the past month are: 3EH, 3MU, 3BA, 3FB, 3DT, 3NB.

The District Superintendent is pleased to report that the amateurs in this district have uniformly observed the request of Bureau of Standards to stand by during test hours. Very successful recording work is being done by the recording stations in this district. The spirit shown has been of the best and every station stands ready to do anything that will be of aid in bringing these tests to a successful conclusion.

The non-delivery of certain traffic has been called to the attention of the District Superintendent. Such cases were reported as long as three or four months ago. Test messages were sent and but 30 per cent. of this traffic ever reached its destination. The points of non-delivery were Philadelphia and New York City, chiefly the latter. The conditions in Philadelphia have been improved and the cause of non-delivery traced. But delivery in New York City has proven uncertain and unreliable. This is no doubt the fault of the smaller stations to whose hands the traffic was entrusted. Care has been taken to forward

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traffic to prominent and reliable stations in that vicinity and addresses have been repeated and sent with care, but the results have been no better. I believe this matter should be brought up in meetings of local Radio Clubs and the importance of delivery impressed upon the members, especially the owners of the SMALLER STATIONS who, in most cases, are asked to assume the responsibility of delivery. It is fine work to transmit messages hundreds of miles and accomplish all kinds of DX work but the little fellow who delivers the message deserves EQUAL CREDIT in my estimation. Let's give the credit he rightly deserves together with some encouragement and perhaps the coming winter will see more traffic reach its final resting place, especially in the larger cities.

The District Superintendent for Eastern Pennsylvania has the following to report:

Condition of Trunk Lines and Branch Lines In Eastern Pennsylvania District:

(a) Trunk Line B—Northern route, no station has yet been found to replace 3GX in Reading. The Pottsville station is not yet in commission.

(b) Trunk Line B—Southern route. No further progress.

(c) Trunk Line D—Stations 3DH and 3EE, the connecting links to the northward on this route, have not been active recently, and traffic for New York has been handled by long jumps. Southward, satisfactory communication with 3BE has been established through 3ZA station; 3BE has, as far as known, no outlet to the south.

(d) Branch Line No. 1. Station 8CE at Scranton has been very active, and has succeeded in handling some traffic through 3NB. This may provide a temporary method of routing traffic to the northeast part of Pennsylvania, until the shorter jumps are in working order.

Conditions Around Philadelphia:

3ZA station has recently been put in full commission, and has handled considerable traffic from Philadelphia by means of long jumps.

The District Superintendent for Central Pennsylvania reports that—

Conditions in the Central Pennsylvania District have not changed to any extent since the last report was made. Efforts to locate relay stations between Milton and Pittsburgh have so far failed. No reply has been received, to date, from the radio club in Harrisburg concerning prospective relay stations at that point.

Owing to the fact that the location, which was rented in order to get this station in operation at once, was sold and that he was forced to vacate, station 8BQ is out of commission again as far as his 1 k.w. is concerned. The power service is very poor and does not allow the use of this transmitter. However, he has installed an Amrad 100 watt transmitter for the present with which it is expected to reach Danville, who can connect up with Pottsville when required. This will provide an excellent chance to test the possibility and worth of 'short jumps on low power', which is very strongly in favor. Plans are being made to have a permanent and efficient station in operation by fall, if not sooner, in order to connect up with Pittsburgh, providing this long jump is necessary.

We hear from Mr. Devinney, Superintendent for Western Pennsylvania, that relay work in this district has fallen off about fifty per cent. in the last month, due mostly to warm weather and some very bad storms. The number of messages handled will run in the neighborhood of 300.

The chief interest just now seems to lie in fixing the sets up for next fall and experimenting with the CW which, he believes, will be the only thing as soon as the bulb situation gets straightened out.

Line up of Branch Line No. 2:

Uniontown, R. M. Sincock, J. McKinley, 8MT.
Pittsburg, B. P. Williams, 8EN.
Pittsburg, R. M. Carson, 8RQ.
Pittsburg, Wm. H. Raring, 8LH.
Monaca, J. E. Ahrend, 8DV.
New Castle, R. J. McConnell, 8ADF.
Greenville, P. A. Riley, 8CH.
Meadville, V. L. Wise, 8GN (out for the summer).
Cambridge Springs, D. M. Lord, 8WY.
Erie, The Summit Radio Club, 8UG.

There is a station at Washington, Pa., located in the High School that has been handling all messages in that locality but they change operators every term as the set belongs to the High School and of course the operators come and go, and on that account they have been left out.

Mr. Devinney's appointment of Burton P. Williams, 3220 Orleans Avenue, Pittsburg, as his traffic assistant has been approved.

The District Superintendent for Maryland reports that radio is very dull in his vicinity with the exception of the QSS tests, which have been recorded regularly by a number of Baltimore stations. 9LC is the only station which has not been heard so far. It is interesting to note that results of Baltimore stations have so far checked with Washington stations, 40 miles away, while stations in Philadelphia get different curves than 3NB of Vineland, 45 miles away.

Stations in and around Baltimore have tried to connect with Phildelphia during June, but so far 3HG has been the only one to reach Philadelphia (3HJ) and work for any length of time. 3NB is received QSA in Baltimore and if the next season finds it impossible for Philadelphia stations

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to work Baltimore direct, this may be used as an alternate route.

No report has been received from the District Superintendent of Delaware. Philadelphia and Wilmington are in communication day and night and there is little delay in the exchange of traffic. Unfortunately there is no southern outlet for Wilmington.

ONTARIO DIVISION
A. H. K. Russell, Manager

The past month has been bad for wireless relay work in this division. The heat has got in its deadly work and amateurs have been spending little time at their apparatus in consequence.

The Wireless Association of Ontario recently received a communication from the Naval Department of Canada, which has control of all radio matters, to the effect that the tests conducted throughout the winter of last year with a view to allowing an increase of wavelength to amateurs had proved unfavorable. In consequence for the present the fifty meter restriction stands for Canadian amateurs. The Department adds, however, that they do not regard these tests as final and will conduct more with the closing of navigation this coming fall.

This decision of the Naval Department emphasizes what has been preached by all the leading amateurs in this Division, i.e., that C.W. transmission is the only solution for the amateur in Ontario, compelled to work on so short a wave.

Considerable progress has been made by several experimenters in Toronto during the last few months in the development of C.W. transmission sets for amateur work, and it is almost certain that by the fall there will be several medium powered C.W. transmitters in operation in Toronto and vicinity, with prospects of a larger station being operated as well. In any case there is not the slightest doubt but that communication will be easily maintained by C. W. with the "8" stations to the south and west of us.

NORTHWESTERN DIVISION
Royal Mumford, Acting Manger
Vancouver, Wash.

The long dreaded summer season of static and high tension induction now drowns out the distant stations and handicaps our work with those near by. Yet we continue to battle with these unfavorable conditions for the supremacy of the air. It is hard to listen to static that drowns out everything for hours at a time. But all things come to him who waits. Occasionally signals do manage to break through. Here, "sixes" as far south as San Diego are picked once in a while when static relaxes its intensity. And "sevens" are heard at least as far south as Los Angeles.

Right here it may not be out of place to mention a little observation on my part regarding static and LD signals. If you listen in closely just before dark you hear little static and signals—well just wait for them. Often the LD start coming in fine as early as 7 o'clock. They usually make themselves heard sometime between 7 and 9. A minute after you hear one, they are coming in by the dozens. The best part of it is that static usually waits until after the LD signals have been traveling great for about half an hour or more!! Here we have a good half hour of LD opportunities, but everybody is hamming around locally, and the business stays on the hook. Now why can't we give up a little of our local conversation and take advantage of our LD Opportunities? This 2:30 A. M. stunt is all right but why not snap out of it, as some are doing, and clear our business ahead of the static? We can't do this every night of course. The static isn't always so accommodating, and LD doesn't always come in so well, but if we all watch and take advantage of conditions when possible, it will help out wonderfully.

Relay traffic north and south keeps moving, often slow to be sure, but perseverance always wins. Stick-to-it-iveness has been developed to the n'th degree. The relayers who put traffic through these days deserve all the more credit for their service in spite of present handicaps. On the whole relay work has actually been increasing during the last month. In Seattle 7AD, 7BK, and 7AN are evidently determined to stick to the job all summer. In Tacoma 7BC has recently connected south direct. However, 7CE handles most of the traffic. Here we have also 7CF whose spark is easy to read through static. At Vancouver, Wash., 7CU has handled over 80 messages during the past month.

In Portland considerable interest has been shown in relay work lately, in spite of the poor radio weather. 7CR and 7BP are on the job nearly every night and work north and south consistently. Most of the traffic south now goes through Ukiah, California. 7ED and 7DS are doing nearly as good work and may be depended on to give better account of themselves when conditions become more favorable. One commendable feature of Portland is the absolute control of spark coil amateurs by the Northwestern Radio Association of that city. Mr. White in charge of the work reports that the city is divided up into a number of districts over each one of which an assistant is put in charge. It is up to this assistant to run down every spark coil in his territory and pay each offender a personal visit. The youngsters are fast becoming well informed regarding the Gov-

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ernment Radio Laws and regulations. And what is more they are invited to attend the meetings of the N.R.A. At these meetings they are given opportunity to learn as much about radio as they are willing to assimilate. This practice not only eliminates the law violations from the "squeak-box", but also interests all amateurs in long distance work.

Considerable interest is shown in the line up of relay stations to the east, but the stations in the eastern part of the division are noticeably scattering. The mountainous condition of the country makes even short jumps of 50 or 100 miles just about as hard to cover as 500. Disappointment is expressed by a number of anxious amateurs of this locality in their inability to do much work outside of town. At the same time hope is expressed that the A. R. R. L. can line up something, so that the use of their stations can be made worth while. This is exactly what we are going to do for these fellows. A number of new stations are going up, and old stations are being improved. Next winter will show unprecedented activity in Montana and Idaho.

Mr. R. S. Dawes, Box 663, Bozeman, Montana, has been appointed District Superintendent of Montana. He reports that wireless work in the state is almost at a standstill as most amateurs have closed their stations on account of static and storms. At the first opening weather he will be right on the job, and ready to get things started the right way.

The Electrical Engineering department of the Montana State College, Bozeman, Montana, has been organizing Radio Clubs through the local High Schools all over the state. Their station 7XB has been transmitting college news and giving code practice QST's on 425 meters. We will learn the results of their efforts as soon as things open up next fall.

In Silverton, Ore., 7CW continues working north and south with ease. Mr. DeGuire has been appointed District Superintendent for the state of Oregon and will give us a report next month.

Mr. Woodworth, 7CC, has been appointed District Superintendent, Moscow, Idaho. Mr. Teed, 7FT, Kuna, Idaho, has been appointed District Superintendent for Southern Idaho. We will be glad to have their reports in the next issue.

Mr. L. E. O'Brien, 7EV, Assistant Division Manager, 709 South 10th Street, Tacoma, Wash., reports an attempt was made to form eastern route "A" but due to lack of stations operating this summer, work has been suspended until the fall season opens up. Experimental CW has taken quite a hold in Tacoma and Seattle. With a single bulb transmission of speech has been heard several miles. A recent addition to the radio field is BF1 with a powerful CW set. He claims he is 80 miles south of Tacoma (?) but is too bashful to give his name or whereabouts.

Recent tests from Tacoma to San Francisco Bay stations reveal the fact that QRN is still going on and we take our hat off to the "ops" who have the patience and perseverance to put a message through during these times. Up to date 250 messages have been handled through Tacoma for all points. Communication south is usually effected through 7CU, Vancouver; 7CR, Portland; and 7CW, Silverton, Ore. 7YS is still reaching the 6th district stations and Rev. Ruth is to be commended on the efficiency of his set. 7CE was appointed traffic clearing station in Tacoma. Route all messages south via 7CE. This will insure better results in clearing up traffic.

Puget Sound Navy Radio puts out a bulletin for amateurs and can be secured gratis by writing to District Communication Superintendent, Navy Yard, Bremerton, Wash.

ROANOKE DIVISION
W. T. Gravely, Manager

Although the hot weather and static are now bearing down on us with fury, the stations in this Division continue to operate nightly, with a fair degree of success. It is really remarkable how signals are holding up through the heated term, and it is to be hoped that these conditions may last all through the summer months.

Of special interest in this Division are the Fading Tests which are being conducted for the Bureau of Standards, and I feel sure that when the data has all been collected it will afford material for reflection for days to come.

The A. R. R. L. has a formidable task before it in the QSS Tests, which are being held during July and August, but with the consistent co-operation of the amateurs throughout the entire country much valuable data will be available and well worth the time and energy expended.

Outside of the Seaboard District (Eastern Virginia), the Division remains unorganized, but tremendous efforts are being made to effect well defined lines, and to create new stations where they are most needed. It is a long weary road to travel, and will necessitate lots of hard work, but we will eventually be there.

I would like to hear from one or two stations in Eastern North Carolina, who will undertake the organization of that District, and who will co-operate with the other District Superintendents in forming lines. You Eastern Carolina fellows come on and help out. Let's hear from you immediately.

I will also ask that the stations in South-

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ern West Virginia communicate with Mr. Jno. F. Wohlford, and let him know that he may count on their co-operation in the formation of lines through West Virginia, in conjunction with Mr. A. G. Heck, the District Superintendent for Northern West Virginia. It is very gratifying to note the increased activity in the Northwest Virginia District. Mr. Wohlford has rendered me a detailed report on the progress he is making in lining up prospects in various points where stations will count in our routes, and I extend him my thanks for his splendid efforts.

3HO, Blair, writes that he has to dismantle his set, but expects to operate the High School station in Richmond (3UV), so the League will still have a station there to count on.

Reports have reached me to the effect that a 1 K. W. station is being erected by the Lynchburg Cotton Mills at Lynchburg, Va., and a similar station at Greensboro, N. C. for the private use of the Company, but efforts will be made, on my part, to have the operators co-operate with the ARRL, and assist in the relay work. (Lynchburg please take notice). Mr. J. R. Wikle, formerly 4DM of Atlanta, Ga., is doing the construction.

L. C. Herndon, Superintendent for Eastern Virginia, reports that so far, no new stations have been located in the Eastern Division, but there are hopes that sooner or later a station will be opened in Fredericksburg and one in Petersburg, in which case there is no doubt that daylight communication between Norfolk and Richmond is assured.

The problem of decreasing the interference from the local Navy Station, NAM is being handled through official channels and it is hoped that in the near future the station will be retuned and the decrement lowered. There are also several commercial stations under construction or being planned along the Atlantic Coast, and as soon as these are opened the biggest part of commercial traffic will be handled through these stations, thereby greatly decreasing the amount of business NAM will have to handle. This will be of inestimable benefit to local relay stations.

All of the relay stations in this vicinity are equipped with amplifiers and regenerative receivers, and are getting excellent results, long distance amateurs coming in steadily, and as soon as our transmitters are gotten into shape, it will be hard to find a series of more efficient stations. The Norfolk Police Dept. has installed a .6 Telefunken transmitter (Call 3ZC) and the Norfolk Radio school a 1 k. w. Independent set (Call 3YD). The latter station is accessible to the Hampton Roads Radio Association, and although no long distance relaying has as yet been done by these stations, it is hoped that shortly they will be added to the list of efficient relay stations in the vicinity of Hampton Roads.

T. C. White, City Manager for Norfolk, advises there is but little to report this month due largely to the adverse weather we have been having in this district; also on account of two of the best stations, 3HO and 3FG, having had transformer trouble.

Station 3EN has been busy Tuesday, Thursday and Saturday evenings with the Bureau of Standards QSS tests and aside from that, has handled several relay messages to distant points, longest distance being 1HAA, Mr. Vermilya at Marion, Mass., who said 3EN QSA very. Worked NSF several times, he using phone and CW both. We are very anxious to have Mr. Blair, 3HO, of Richmond, Va., hurry the installation of his equipment in order that a possible connection in daylight may be made. It is believed with his station in good working order, that we can connect with his station, he in turn with 4CC, and then on down the line. North of us there are no stations nearer than Washington, D. C., and it is exceedingly difficult to work those stations at night, much less in daylight, and we would like very much to hear of any stations intermediate in order that daylight communication may be established North of here.

CENTRAL DIVISION
R. H. G. Mathews, Manager

During the past month traffic work has been carried on with fair satisfaction considering the handicaps of static and poor transmission due to the summer weather. No difficulty has been experienced in handling messages between Chicago and the East and especially good work has been done by the Ohio stations. Transmission has been very indifferent South and West although fair results have been obtained on Northbound messages due to the operation of the Shore route of Mr. Burhop.

Interest has been aroused in the fading tests being held by the Bureau of Standards and those proposed by the League and it is hoped that these tests will have the effect of reviving some of the missing interest in the southern and western parts of the Division.

Plans are on foot for a Central Division Convention to be held in Chicago the first week of September, this convention being open to all radio men in the Division and to include the usual banquet and meetings as well as individual good times. Mention of this Convention is made elsewhere in this issue.

The Chicago Executive Council has proposed and put into effect traffic rules governing local and long distance work in Chicago and accordingly the Division Manager wishes to notify all stations outside of Chi-

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cago that this city is not open for long distance traffic prior to 9:00 P. M. Central Standard Time or 10:00 P. M. Chicago daylight saving time. The only exceptions to this rule will be special tests and messages of extreme urgency, in which case permission will be given for operation prior to that time by the Chicago City Manager. By eliminating long distance work prior to the set time, and correspondingly limiting local work after this time it is believed that better co-operation can be secured between the local and long distance stations of the city and the Division Manager requests the co-operation of other long distance stations in the Division in maintaining this rule. It is requested that messages for Chicago or for relay through Chicago be held until 9:00 P. M. Central Time and that in order to further the work of the Chicago Executive Council no attempts be made to forward such messages earlier unless these messages are of extreme urgency.

Because of the pressure of other business Mr. K. A. Duerk, District Superintendent of Western Ohio, has been forced to suspend his activities during the summer months and Mr. and Mrs. Charles Candler of 8ER, who have been doing such excellent relay work unofficially, have been appointed acting District Superintendents for Western Ohio, this appointment holding until further notice. In this connection the Division Manager wishes to express his appreciation to Mr. and Mrs. Candler for their splendid co-operation during the past relay season and for their present work along the lines of summer relay work.

MIDWEST DIVISION
L. A. Benson, Manager

Very little traffic has been handled in this section the past month due to the fact that QRN has been terrific. Several early morning tests were tried out with little success.

J. G. O'Rourke, District Superintendent Eastern Nebraska, reports that at last interest in radio matters and particularly in our A. R. R. L. is beginning to revive in his district. It is a rather slow revival at present but by Fall intrastate traffic routes will begin to assume a permanent shape. Mr. Karl V. Nyquist, of 9AFX, Stromberg, deserves great credit. Hardly a morning passes without 9AFX on the job. He is taking great interest in the counties surrounding his station. Mr. Parmele, of Plattsmouth, is still improving the efficiency of his outfit and by next month will prove a valuable asset to the district.

Efficient relay stations are operating in the following towns: Wahoo, Norfolk, Wayne, and Oakland. According to recent reports a former A. R. R. L. man of Colorado is locating in Omaha. Mr. E. Anderson of 9EW is fast coming to the front. Between June 11th and 20th, over 125 messages were handled between the Cadet Encampment at Valley and two Omaha stations. The station at Valley was installed for the purpose by the Assistant District Superintendent, Mr. Fred Bullis. 9SC and Fort Omaha WII handled the Omaha end.

Several radiophone tests have been conducted by Mr. O'Rourke and he takes great pleasure in reporting that he has been heard by 9AFX while transmitting on one Western Electric tube. 9AFX is 96 miles from Omaha.

Mr. H. L. Owens, District Superintendent, Eastern Kansas, reports that he is working under difficulties trying to establish day light routes east through his state. However, he expects to have one open through 9RY of Topeka in the near future. He has several excellent routes through 5BT of Blackwell, Okla., and west through 9NX or 9BW of Wichita and 9AEG of Eldorado, thence to 9LR of Anthony. They are all good for relay work at nearly any hour during the day. 9LR of Anthony, Kansas, is going to be a strong number in relay work this coming season. His signals are very QSA here on a short wave regenerative set using only one bulb.

Q. M. Shultise of Wichita (9NX), advises that he will not be with us this coming season. We regret this very much as he was prominent in relay circles. Robt. Pirtle, 9SZ of Council Grove will soon have his station in operation and will work alternate to 9EL.

J. A. Wanek, District Superintendent, Western Nebraska, reports that there are very few good stations in his territory and has very little grounds to work on at present. However, a contemplated rearrangement of the division line through the state of Nebraska will give him more territory, and a few good stations. He is lining up several good routes west and expects to have them perfect in the near future.

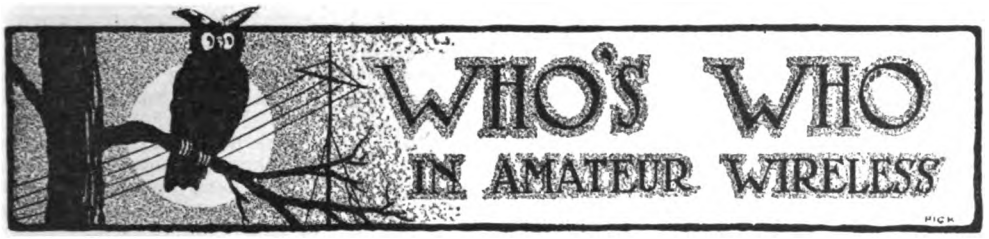
P. A. Stover, District Superintendent, Iowa, is still working hard with his CW modulated and is reported as being heard QSA at exceptionally long distances. He reports his territory a trifle dull at present due to so many of the best relay men being on their summer vacation. Mr. Stover is very busy himself but expects to devote more time to A. R. R. L. matters in Fall.

G. S. Turner, District Superintendent, Western Missouri, is spending his vacation in Chicago and will be unable to give his report this month. He states, however, that things are going along nicely and that he will have one big report for next issue.

J. A. Fritz, District Superintendent, Eastern Missouri, reports that he is still busy trying to establish an efficient daylight route to Kansas City. He has located a good station in Jefferson City and is also

(Concluded on page 32)

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WM. E. WOODS

We take pleasure in presenting the owner of 9LC, commonly known in amateur circles as "Bill" Woods, age 26, of St. Louis. We cannot improve on Mr. Woods' own account of his experiences, so present the whole works:

Started wireless as hobby at age of 14, while in short trousers. Purchased complete outfit from w.k. New York mail-order firm at $11.50 per outfit. Erected aerial which was humdinger, but after listening to various sounds for three weeks with aid of the 75-ohm receiver decided to follow other pursuits and sold outfit to guy next door for $4.50. After thinking over deal, decided to again embark, which did, this at cost of $15. New apparatus was mainly electrolytic interrupter; immediately burned out house meter and three chandeliers of apartment above us at total cost of $35 to male parent. These marvelous results firmly imbedded idea in my mind



H. J. BURHOP.

The above is the best picture we could get of Mr. Burhop of 9ZL, Manitowoc, Wisconsin, and we think his call letters will be sufficient introduction.

Mr. Burhop was born at Sheboygan, Wisconsin, in 1889, and jumped into the radio game with both feet in 1913. As evidece of the fact that his jumping was effective, we have the fact that he had a 1 k.w. station with the call of 9RW in 1915 with which he did some good long distance work, for those times. He went into the service in 1916, and after a year of commercial work joined the Navy at the outbreak of the War, naturally getting into the radio service. He was stationed at various land stations on the Great Lakes, as well as helping beat the kaiser on the U. S. S. Gopher, which the inhabitants of Chicago will remember as the super-dreadnaught which protected them from the vicious onslaughts of the Hun.

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WM. E. WOODS

that wireless was an interesting study but needed great improvement before becoming practical, so constructed laboratory in back yard by remodeling coal shed; purchased ¼ k. w. Blitzen transformer and, after bumming from high school for most of winter term, succeeded in working Racine, Wis., using two-slide tuner and galena to get him on. Got letter from Racine to verify the marvelous fact and on strength of this persuaded father that was a genius and had to have ½ k.w. at once. Installed this in house for convenience's sake, as disliked idea of going through back yard to bed at 2 a. m. through the snow. First night of operations, mother and father simultaneously noted very queer effects in chandeliers of various rooms and firmly requested I move back to "laboratory" with all possible speed. This was done, and began working distance at once, winter of 1914. Been at it ever since against wishes of whole family and neighbors. Got all information by reading radio periodicals and still have first little blue-covered QST, from which I gained much knowledge. I give the following issues all credit for what I know today, and have already begun to teach 2-year son the code while wife and small daughter look on in utmost disgust. Now have close to a thousand dollars invested in radio "junk" and still on the look-out for something new, planning on a "real set" this fall just as I have done twelve times previously. It's great stuff, and I'll sit up until after 4 a. m. ANY good night to prove the assertion.

OPERATING DEPARTMENT

(Concluded from page 30)

getting the members of the Jefferson City Radio Club interested in the A. R. R. L. and they expect to affiliate with us soon.

The Division Manager requests all stations in the western half of Iowa, Kansas and Nebraska who are interested in relay work to get in communication with him at once.

ST. LAWRENCE DIVISION
A. J. Lorimer, Manager

After the unfavorable report last month the present outlook is specially encouraging. We have traffic coming through now over two distinct routes. Both routes are over fairly long jumps, perhaps a little too long for good summer work; nevertheless traffic has been getting through with fair regularity.

3Z, Farnham, Que., has been working 1FV near Portland, Me., quite consistently and affords a good outlet to the New England Division. 3Z has also been QSO with 1HAA (Marion, Mass.).

H. J. BURHOP

Burhop was released from the Navy along with the rest of us and for a time did telegraphing out in Iowa but re-enlisted on condition that he should be stationed at Manitowoc where he could carry on his work as District Superintendent of Wisconsin, which appointment he has held since 1916. He was not satisfied with the amount of traffic at NTY and so he erected 9ZL at Manitowoc on February 1st and has been running 9ZN a good race ever since.

Burhop's specialty is summer daylight communication and the operation of his Lake Shore Route shows what he is doing long these lines.

The Division Manager, from 2BF, has been getting some traffic through via 8BB at Plattsburg, N. Y., and also handled a few direct to 2TF, Schenectady, N. Y.

An old time Montreal Amateur, Mr. Gladden, has opened up a fine station at Ottawa, Ont., call letters 3GT, giving us an outlet to the Capital City and one leg of the Montreal-Toronto route covered.

DAKOTA DIVISION
R. H. Pray, Manager

There is very little being done in the relay field at present due to the excessive amount of electrical storms and the fact that many stations are out of commission for reconstruction.

Mr. Boyd Phelps, Traffic Manager of the Minnesota Wireless Association has been appointed assistant to the Division Manager under the title of "Supervisor of Summer Relay in the Dakota Division", term to expire October 15th. It is generally acknowledged that it is always difficult to reach the Twin Cities and his special commission is to establish routes in all directions in reliable relaying distances. Everyone is asked to co-operate with him as far as possible He can be reached by mail in care of the Minnesota Wireless Association, 416 Court House, Minneapolis, or by radio, 9ZT.

Mr. James Schultz, who has been Superintendent of the Southern Minnesota District, has resigned because of lack of time to look after ARRL matters properly, and Mr. Phelps will for the present assume the duties of District Superintendent in addition to his own.

Mr. J. A. Gjelhaug, 9ZC, Northern Minnesota District Superintendent, reported some correspondence with H. Clark of the Manitoba University, Winnipeg, and that Mr. Clark is getting a regenerative receiver and will soon be in the relay game.

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QST'S DIRECTORY OF CALLS

FIRST DISTRICT

G. A. F. Werner	12 Pratt St., Allston, Mass.	1SK
A. A. Stockellburg	54 Hano St., Allston, Mass.	1SL
Wm. E. A. Dodge	25 Sargeant Ave., Beverly, Mass.	1SN
S. M. Zartarian	211 Fayerweather St., Cambridge (Correction)	1SP
Saymond Sorenson	340 Beechwood Ave., Bridgeport, Conn.	1SQ
Samuel S. Frizzell	Washington St., Duxbury, Mass.	1UD
Allan C. Lawson	10 Dikeman St., Waterbury, Conn.	1UJ
J. H. Washburn, Jr.	9 Wesley St., Somerville, Mass.	1UK
E. L. Shepard	76 Pine St., Bath, Me.	1UL
Jerome Richardson	County Road, Ipswich, Mass.	1UM
W. H. Cook	184 Main St., Pittsfield, Maine	1UO
Bert J. Atwell	25 Poltoma St., Pittsfield, Me.	1UP
H. W. Castner	441 Congress St., Portland, Me.	1UQ
John R. Walker	140 Water St., Guilford, Mass.	1UX
John Hardy	Foster St., Littleton, Mass.	1UZ
Sands A. DenFish	113 High St., Mystic, Conn.	1VB
L. A. Morrow	104 Charles River Road, Cambridge, Mass.	1VC
Wilbur S. Wellington	15 Lunda St., Waltham, Mass.	1VD
H. B. Prescott	110 Crescent St., Portsmouth, N. H.	1VE
R. McK. Strickland	384 Orchard St., New Haven, Conn.	1VG
F. X. LaFrance	93 Warren Ave., Pawtucket, R. I.	1VH
L. W. Sayward	87 Hamden Circle, Wollaston, Mass.	1VI
E. M. Goddard	17 Constance St., Maplewood, Mass.	1VJ
Wm. Rosenbloom	108 Thornton St., Revere, Mass.	1VK

SECOND DISTRICT

A. A. LeMay	1117 Hutton St., Troy, N. Y.	2FA
Harold Cohn	546 W. 146th St., New York	2FB
Fred Clayton	607 Emory St., Asbury Park, N. J.	2FC
A. S. Brower	19 South Clinton St., Poughkeepsie, N. Y.	2FF
H. D. Schedler	190 South St., Jersey City, N. J.	2FH
Frederick A. Girard	Magnolia St., Montvale, N. J.	2FJ
R. W. Freure	439a McDonough St., Brooklyn	2FK
F. McCartin, Jr.	524 Paige St., Schenectady, N. Y.	2FM
V. H. Schmitt	158 Catherine St., Elizabeth, N. J.	2FN
W. S. Blanchard	401 Westervelt Ave., New Brighton, N. Y.	2FO
Harold Peller	321 East 90th St., New York	2FP
Jos. Pignone	2065 Anthony Ave., New York	2FQ
H. L. Stanley	Prospect St., Babylon, N. Y.	2FS
W. E. Murray	521 North James St., Peekskill, N. Y.	2FT
Chas. I. Herts	501 West 144th St., New York	2FU
N. S. Conover	132 Milligan Place, South Orange, N. J.	2FV
C. V. Macpherson	590 West 172d St., New York	2FW
R. V. D. Gedney	Center Ave., Little Falls, N. J.	2FX
F. Frimerman	334 East 100th St., New York	2FZ

THIRD DISTRICT

Wilbur Clark	919 South 51st St., West Philadelphia	3HZ
H. L. Strang	2020 First St., N. W. Washington	3IL
Milton Bergey	121 North Mill Road, Ashboarne, Pa.	3IM
Leonard S. Wall	Elkins Park, Pa.	3JI
J. E. Krone	2908 West Ave., Newport News, Va.	3JK
Merritt E. Gregory	61 Ridgedale Ave., Morristown, N. J.	3JL
Walter L. Henry	3 Park Ave., South Richmond, Va.	3JT
J. D. Simpson, Jr.	600 West 25th St., South Richmond, Va.	3JY
Robt. E. Linthicum	2013 Benning Rd., N. E. Washington	3KM
Harold Nielsen, Jr.	8751 Frankford Ave., Holmesburg, Philadelphia	3MN
Walter Rau	2085 East Kingston St., Philadelphia	3OW
Frank Olson	1943 Harlan St., Philadelphia	3PE
Jay V. Hoyt	Delaware, N. J.	3VU
Howard S. Frazier	5714 Hazel Ave., Philadelphia	3WI
N. Hamilton	4427 Sanson St., Philadelphia	3WW

FOURTH DISTRICT

H. R. Martin	915 7th St., Miami, Fla.	4BH
Winford W. Brown	214 7th St., Miami, Fla.	4BI
Samuel Mishler	Route B, Miami, Fla.	4BR
Maurice D. Clark	1924 Swift St., Jacksonville, Fla.	4BP
W. E. Wood	809 Palm Ave., Miami, Fla.	4BS
Don W. Moore	78 Filer Ave., Miami, Fla.	4CJ
Wm. A. Marsh	135 Bayside Park, Miami, Fla.	4DE

FIFTH DISTRICT

Lloyd B. Quinby	2204 Brazos St., Houston, Tex.	5CA
Chas. B. Galloway	1516 Arch St., Little Rock, Arkansas	5CB
Frank M. Corlett	1101 East Eighth St., Dallas, Texas	5CC
Clyde B. Mosteller	Box 404, Pilot Point, Texas	5CD
Holmes Richter	116 North Willow St., Dallas, Texas	5CE
T. B. Ancell	927 North Marsalis Ave., Dallas, Texas	5CF
Marion Apple	407 North Tennessee St., McKinney, Texas	5CG
Arthur H. Holt	Kountze, Texas	5CH
M. B. Patterson	Frost, Texas	5CI
Ernest Albert Rodenhouse	2788 Judson St., Shreveport, La.	5CJ
Earl Sellers	Lucedale, Miss.	5CK
James F. Burnes	501 East Grand Ave., Marshall, Texas	5CL

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C. E. Noll	804 North Oregon St., El Paso, Texas	5CM
C. R. Granberry	711 West 7th St., Austin, Texas	5CN
Fred James Marett, Jr.	700 Stuart St., Houston, Texas	5CO
A. W. Walton	1823 West Park Place, Oklahoma City, Okla.	5CP
Gerald Mora	1601 21st St., Galveston, Texas	5CQ
E. L. Durbin	139 Riverside Ave., Little Rock, Arkansas	5CR
Wm. Hardeman	Box 427, Waco, Texas	5CS
James Milton Peck	510 Monroe St., Little Rock, Arkansas	5CT
L. B. Sartain	South Pittsburg, Tenn.	5CU
Harvey W. Smith	114 South Arno St., Albuquerque, New Mexico	5CV
R. W. Goddard	State College, New Mexico	5CW
College of Agr. & Mec. Arts	State College, New Mexico	5CX
Howard Hughes, Jr.	3921 Yoakum Boulevard, Houston, Texas	5CY
Joseph Moran	429 South First St., Clarksville, Tenn.	5CZ

SIXTH DISTRICT

O. Schwendt	1046 Blackstone Ave., Fresno, Cal.	6DT
C. Scruggs	1178 E. 47th St., Los Angeles, Cal.	6DU
C. Stine	1226 West 30th St., Los Angeles, Cal.	6DV
J. B. Taylor	111 Gaven St., San Francisco, Cal.	6DW
C. W. Tilden	1635 Waltman Ave., Los Angeles, Cal.	6DX
H. F. Topping	222 West Richmond Ave., Richmond, Cal.	6DY
R. A. Tulp	1225 Sycamore Ave., Highland Park, Los Angeles, Cal.	6DZ
H. C. Seefred	343 South Fremont Ave., Los Angeles, Cal.	6EA
L. F. Seefred	343 South Fremont Ave., Los Angeles, Cal.	6EB
Dr. L. E. Waters	Suite 7, Mitchell Bldg., Anaheim, Cal.	6EC
H. White	822 East 4th St., Santa Ana, Cal.	6ED
S. K. Whitehead	138 North Bixel St., Los Angeles, Cal.	6EE
C. G. Widing	904 East 42nd St., Los Angeles, Cal.	6EF
E. A. Williamson	2101 Stockton Blvd., Sacramento, Cal.	6EG
H. E. Wright	315 Alvarado Court, Pomona, Cal.	6EH
Ed. S. Carter	7105½ Franklin Ave., Hollywood, Cal.	6EI
J. V. Wise	Walnut-Grove, Cal.	6EJ
N. Yale	687 North 43rd St., Los Angeles, Cal.	6EK
G. G. Mackey	1526 Crenshaw Blvd., Los Angeles, Cal.	6EL
L. T. Delimlow	426 1st Ave., San Diego, Cal.	6EM
H. A. Duvall and C. Esler	4965 Wadsworth St., Los Angeles, Cal.	6EN

SEVENTH DISTRICT

C. F. Kennedy	Kelso, Wash.	7BV
C. A. Hoffman	618 Sunset Ave., Seattle	7BW
F. F. Taylor	227 No. Millern, Burley, Idaho	7BX
W. K. Bert	1924 Ninth Ave., Seattle	7BY
E. O. Robbins	300 Fir St., Olympia, Wash.	7BZ
E. A. Scharf	6320 22d Ave., Seattle	7CA
Miss Winifred E. Dow	2329 So. K St., Tacoma	7CB
A. F. Liffrig	Creston, Mont.	7CD
H. G. Reichert	818 No. L. St., Tacoma	7CE
R. J. Alexander	5046 So. K St., Tacoma	7CF
C. J. Kennison	1521 Alturas St., Boise, Ida.	7CG
N. G. Carleston	1067 E. Burnside, Portland, Ore.	7CI
C. R. Capehart	6314 So. Yakima, Tacoma	7CJ

EIGHTH DISTRICT

W. S. Burkhart, Jr.	Cherry Hill, Reading, Ohio (Correction)	8DI
Asbury G. Wilson, Jr.	400 Hampton St., Wilkinsburg, Pa. (Correction)	8BX
Wm. C. Glies	508 E. North Ave., Pittsburgh, Pa.	8EA
Russell M. Blair	3930 Ivanhoe Ave., Norwood, Ohio	8EB
M. Fay McDowell	612 Mithoff St., Columbus, Ohio	8EC
Jordan Ross	92 Hobart St., Rochester, N. Y.	8EE
Albert G. Heck	301 Highland St., Mannington, W. Va.	8EF
Chas. S. McCain	Moraine Park, Dayton, Ohio	8EG
Wm. Morris Stormer	9½ Cleveland Pl., Jamestown, N. Y.	8EH
Abe I. Frankel	207 Bannington St., Rochester, N. Y.	8EI
Prescott G. Schlotterbeck	1907 Washtenaw Ave., Ann Arbor, Mich.	8EJ
Sidney S. Greenwood	237 Augustine St., Rochester, N. Y.	8EK
Thos. Myers, Jr.	41 Michigan Ave., Buffalo, N. Y.	8EL
Clarence M. Minnis	740 Walbridge Ave., Toledo, Ohio	8EM
Burton P. Williams	3220 Orleans St., Pittsburgh, Pa.	8EN
Wm. H. Griffiths	491 Locust Ave., Washington, Pa.	8EO
Lyle H. B. Peer	409 Davis St., Elmira, N. Y.	8EP
Wayne A. Copeland	51 Center St., Warsaw, N. Y.	8EQ
Roland F. Relyea	50 Washington St., Warsaw, N. Y.	8ES
Frederick O. Lee	R.F.D. No. 3, Seneca, N. Y.	8ET
Allan L. Machesney	3414 Parkview Ave., Pitsburgh, Pa.	8EW
H. S. Burns	111 W. John St., Martinsburg, W. Va.	8EY

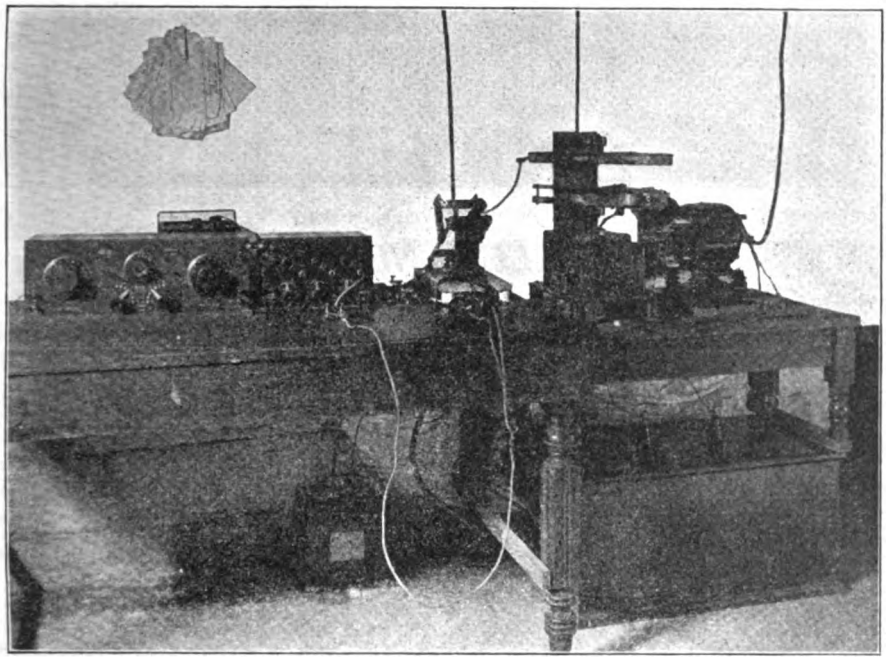
NINTH DISTRICT

Virgil Jackson McElroy	315 N. Pleasant St., Independence, Mo.	9GA
John Hay S. Lawson	Box 850—RR 1, Mt. Washington, Mo.	9GB
E. H. Giddings	414 North Broad St., Lanark, Ill.	9GC
Harold DeRos Jones	3900 Harriet Ave., Apt. 5, Minneapolis, Minn.	9GD
Kenneth O. McBride	812 S. Delaware St., Independence, Mo.	9GE
James C. Hyde	703 E. Hyde Park Ave., St. Joseph, Mo.	9GF
Charles Ring Davis	628 Obion St., Hockman, Kentucky	9GG
Lucas Tylekens, Jr.	104 S. White Ave., Kansas City, Mo.	9GH
Everett C. Smith	Weedman, Illinois	9GI
Nilie Edison Nofrey	Borden, Indiana	9GJ

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2JU, WOODHAVEN, L. I.



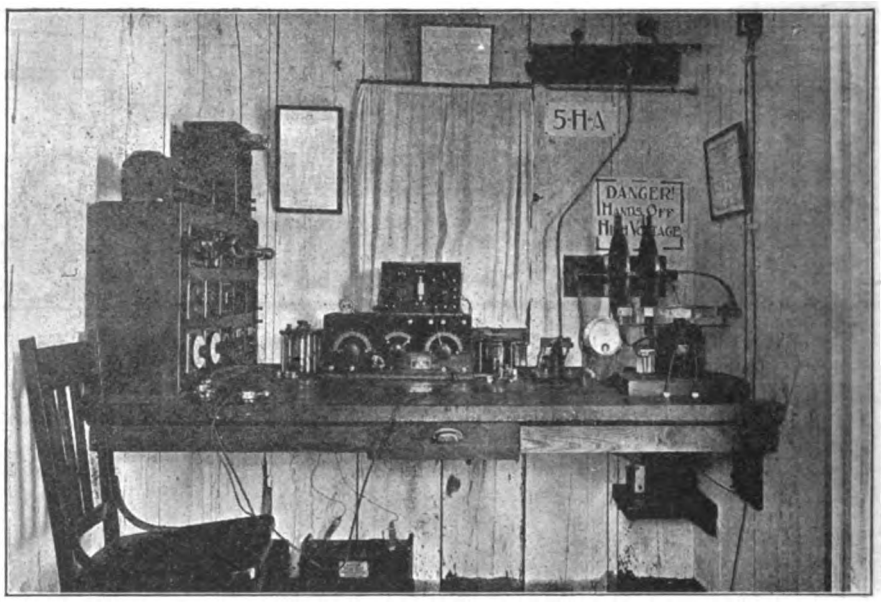
2JU is the call of the A. R. R. L. District Superintendent for Brooklyn, Mr. Clifford J. Goette, and is very well known throughout the eastern half of the country.

The extreme simplicity of this station is striking, but in our estimation this is an essential in a good relay station. In other words, this station looks very much as one would imagine it would, from hearing it on the air.

The transformer, under the table, is one of the old 30,000 volt United Wireless open-core "coffins" which a number of prominent relay stations have used with excellent performance. In a compact group on the transmitting table are a Grebe synchronous rotary, two .014 mfd. Dubilier mica condensers in series giving a net capacity of .007 mfd., and the familiar pancake O. T. Note that the arrangement is such as to make the closed-circuit leads extremely short. Mr. Goette states this type of gap seems to be very efficient with the open-core transformer and he expects to break records next winter.

The receiver consists of a Grebe regenerative tuner and Grebe tube equipment—detector and two-step—and Baldwin phones. Except for the key and change-over switch, also an old United, there is nothing else on the table. The influence of a little commercial experience is certainly seen in this station—things are business-like and arranged for the efficient handling of traffic.

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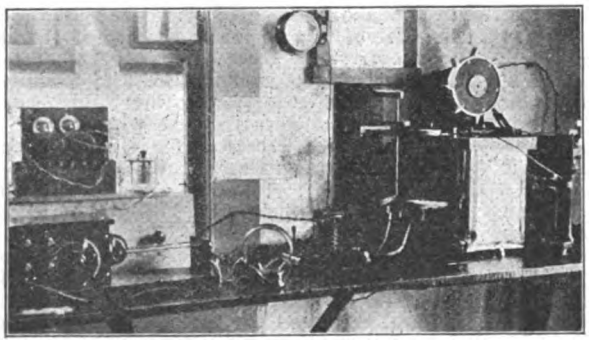
5HA, ALEXANDRIA, LA.

5HA, the station of Mr. F. B. Beuhler, Alexandria, La., seems to be an exceptionally well-ordered station. Everything is conveniently arranged and well installed —the kind of a relay station we like to see.

The photo is so clear that very little explanation is necessary. The transmitter consists of a ½ k.w. Thordarson transformer, Dubilier mica condenser, Hy-Rad rotary gap (mounted vertically to shorten the leads), pancake oscillation transformer, and a thermo-couple type of antenna current meter. The receiver for short waves is a Paragon regenerative, with deForest variables; while a 15-unit deForest set employing honeycombs is used for all waves above 600 meters—to our mind a splendid arrangement. A two-stage amplifier is available for use on either receiver. No trouble is had copying arcs and sparks on both sides of the water, and many DX amateurs are heard with fine audibility.

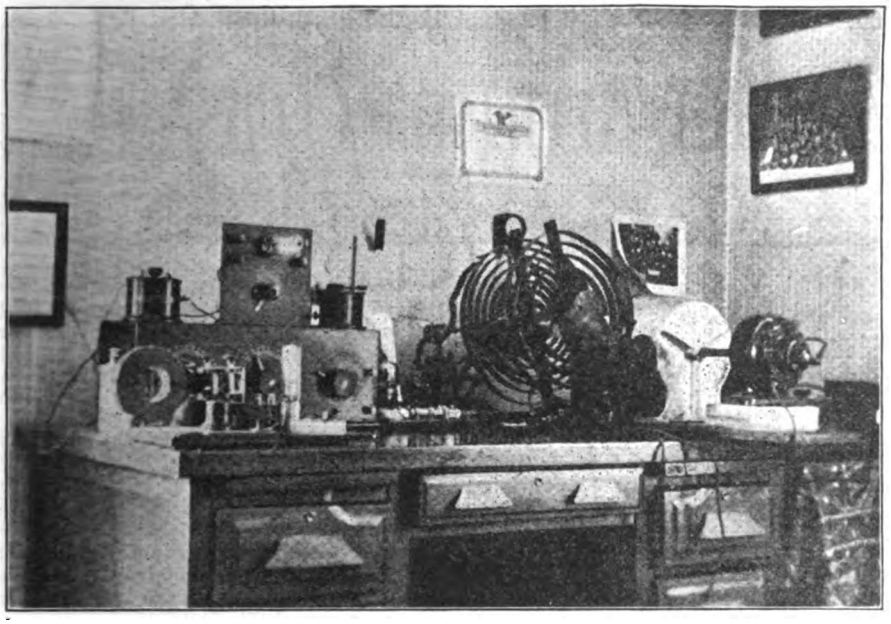
5HA puts 5.2 amperes in the aerial, and should be an important relay station next fall.

7CC, MOSCOW, IDAHO



This western station is an important link in our route to the northwestern coast. It is operated by the District Superintendent, Mr. Rupert E. Kempf. Thordarson transformer, rack condenser, Hy-Rad gap, Murdock switch, and Adams-Morgan oscillation transformer will be noted on the transmitting side. Antenna reading is 8.4 amps., with 8 inches coupling, and communication has been had with 9JE, 6EA, 6BR, 6BQ, 6ZA, etc., while the record transmission is to 9CA and 9EE.

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1AK, FALL RIVER, MASS.

This is the station of the A. R. R. L. Superintendent for Lower Massachusetts and Rhode Island, Mr. Harold C. Bowen, which has done excellent work this season.

Transmitter consists of an Acme ½ k.w. transformer, seven sections of Murdock condenser, a Benwood rotary, and a Thordarson oscillation transformer. Antenna current of 3.2 amperes is obtained with six inches between the O T. windings. For short waves, the receiver is a Paragon, with Wireless Specialty Apparatus Co., two-step amplifier. An Eaton oscillator and honeycomb coils are used for long waves, with the amplifier so connected to a small key switch that in one operation the aerial and amplifier can be switched from the short wave set to the long wave receiver.

The antenna consists of six phosphor-bronze wires, 50 feet high and 50 feet long, with a rat-tail joining a phosphor-bronze rope for a lead-in. For a ground, a counterpoise the size of the aerial is used, buried in the ground directly under the aerial, besides grounding onto all the pipes in the cellar.

The receiving record for this station on short waves is 5ZA, Roswell, N. M. Practically all the high powered arc stations have been copied, most of them several feet from the phones. The sending record is Capleville, Tenn., 1100 miles, where the signals were reported QSA with a single bulb and loose-coupler hook-up.

A BRITISH AMATEUR

This is Mr. George W. Hall, a QST enthusiast, at his station at Wigan, England, and we'll say he has quite a receiving set. In fact, he has three of them, covering all waves up to 25,000 meters. The long wave set and amplifiers are not shown in this photo—they are on a separate table on the



left. He uses S. G. Brown reed type receivers (British) and on this aerial hears Carnarvon, Horsea, Nauen, Nantes, Eiffel Tower, etc., all over the house. Can't you hear 8ER too, O.M.?

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THE Chicago Executive Council composed of the officers of the Chicago clubs affiliated with the A.R.R.L. (the organization of which is explained in an article entitled "Radio Club Organization" in the March QST), have adopted QRM regulations for their city as published below, and all Chicago amateurs are being governed accordingly. All amateurs should particularly note that Chicago is not open for long distance work prior to 10 p. m., except on special occasions such as tests or messages of extreme urgency, in which case special authority for such work will be granted by the City Manager.

The following rules and regulations have been adopted for the control of amateur radio traffic in the city of Chicago. Same to be effective on and after Monday, July 12th, 1920, applying to all amateurs who are members of either of the three radio associations,—Progressive, South Side or Ravenswood—or members of the American Radio Relay League.

Operating hours:

6 A. M. to 7 P. M.—Free air.
7 P. M. to 10 P. M.—Local Traffic Only.
10 P. M. to 6 A. M.—Long Distance Traffic Only.

From 6 A. M. to 7 P. M. amateurs can test, tune or transmit locally or to long distance stations without interruption.

7 P. M. to 10 P. M. is given over to **local traffic only** and no one will be permitted to test or tune during that period. If during that period a long distance station calls you, it will be your duty to inform him to QRX until 10 P. M., or have some other station inform him, as it will be made known that the city of Chicago is not open for long distance traffic before 10 P. M.

10 P. M. to 6 A. M. will be given for **long distance traffic only.** During this period no one will be permitted to test, tune or carry on local traffic.

Amateurs located on the north side will be known as either local or long distance stations to amateurs on the south side, and vice versa.

Traffic chiefs will be appointed in each section of the city who will be required to keep a complete log and who will determine which station has priority rights whenever two or more stations conflict.

Under no circumstances will a member of any of the three above named clubs be permitted to communicate with so-called outlaws or unlicensed amateurs. Members will endeavor to locate such stations and make a report to the traffic chief who will in turn report to the City Manager. The City Manager will endeavor to persuade such outlaws to become bonafide members of clubs. In failure of this such outlaws will be turned over to the Radio Inspector for action.

Any violator of the above rules and regulations will be fined not less than 25 cents for the first offense, and accordingly for each offense thereafter.

Remember, fellow amateurs, this is all for your own good and it is the aim of the Chicago amateurs to make this city one of the most efficient in the world.

If there are any questions that are not clear, I would be pleased to answer them if you will write me a letter stating your question.

F. H. SCHNELL,
Chicago City Manager,
2220 Roscoe Street,
Phone Lakeview 2221,
Radio 9AH.

THE CENTRAL DIVISION CONVENTION

The officers of the Central Division have hated to see any part of the country "put it over on them," and it is quite evident that this has been done in the holding of Conventions, as witness those held in Boston and Philadelphia. There is one thing that can be done by the Central Division, however, and that is to hold a Convention which will be ahead of those already held in both quantity and quality if not in date, and accordingly the Central Division Manager is planning on the holding of a Convention of all amateurs of the Central Division, whether League members or not, this assembly to be held in Chicago during the first week in September. There will be a banquet and meeting on the order of those in Boston and Philadelphia, and in addition the Chicago Executive Council will provide for the entertainment of visitors. This Convention will afford an excellent opportunity for the Western and Central Western Amateurs to get together, and attendance, if at all possible, is strong-

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ly urged. Chicago has approximately 500 amateurs and present plans are for each visitor to be taken care of by one Chicago man. There will be sight-seeing tours of the city, both daylight and dark, and the Chicago Executive Council is assuring all visitors of the "time of their lives".

The Chicago Executive Council is acting as "Committee on Arrangements", and accordingly radio men wishing to attend the Convention should get into touch with this Council in order to secure reservations. Such communications may be addressed either to the Chicago City Manager, Mr. F. H. Schnell, 2220 Roscoe Street, or to the Central Division Manager. Mr. R. H. G. Mathews, 1316 Carmen Avenue.

WASHINGTON RADIO CLUB

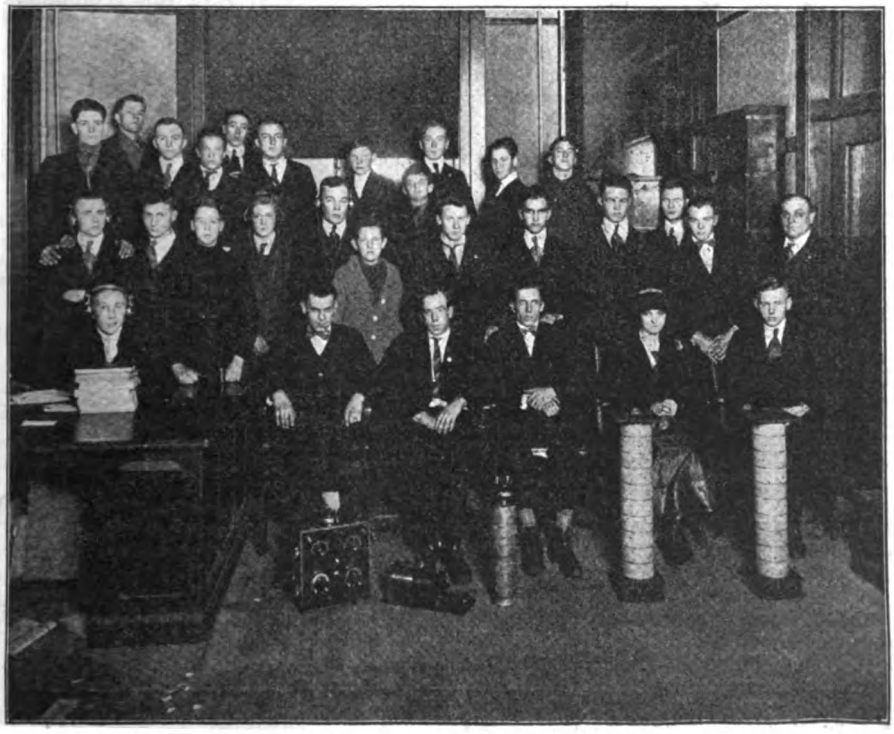
The Washington Radio Club (D. C.) has adopted QRM regulations looking to the improvement of conditions for long distance work after 10 P. M., and has distributed a circular containing the regulations among the local amateurs.

ESSEX COUNTY RADIO ASSOCIATION

This organization (application for affiliation received) was formed in Salem, Mass., three years before the war and increased steadily until the outbreak of war, when most of its members enlisted. It was reorganized in the fall of 1919 and has the largest membership ever, and enthusiasm proportionately great. A strong organization for the whole of Essex County, Mass., is their aim, and Lynn and vicinity have already merged with them as a section. They are a wide-awake outfit, well deserving of amateur support, and their president, Mr. F. Clifford Estey, 22 Oakland Street, Salem, would like to hear from interested amateurs in Haverhill, Lawrence, and Newburyport.

RADIO CLUB OF TACOMA

The Radio Club of Tacoma, Washington, recently voted to become affiliated with the A. R. R. L. This club was first organized in October, 1915, with eighteen members, expanding rapidly until the outbreak of war. Resuming again a year and a half ago, it has outstripped its former progress and is a live-wire and hustling organization, numbering within its body all the prominent radio men in that vicinity. Its Executive Board consists of Lester E. O'Brien, President, District Superintendent of the A. R. R. L.; Geo. Miller, Vice President; Neville Benoint, Secretary; Leslie Lunan, Assistant Secretary and Press Agent; Merritt Cookingham, Treasurer; Chas. Dow and H. F. Campbell, representing the membership at large. A very good photograph of the club is reproduced below. The club would appreciate exchange



The Radio Club of Tacoma

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of papers from other organizations. The secretary's address is 5040 South L Street, Tacoma.

RADIO TRAFFIC ASSOCIATION
Brooklyn, N. Y.

At the regular meeting of the Radio Traffic Association held at Brownes Business College, Brooklyn, N. Y., on June 4th, 1920, the following officers were elected:

Mr. Walram S. Browne, Chairman.

Dr. Dewitt L. Parker, 1st Vice Chairman.

Mr. Joseph LeClair, 2nd Vice Chairman.

Mr. Frank A. Maher, Corresponding Secretary.

Mr. Albert R. Heydon, Recording Secretary.

Mr. F. William Boettcher, Financial Secretary.

Mr. John P. Holder, Treasurer.

Mr. Clifford J. Goette, Traffic Manager.

Mr. Ernest K. Seyd, Editor, "Radio Traffic Bulletin".

Mr. Charles F. Jacobs, Associate Editor.

The above officers constitute the Board of Directors of the Association to serve a term of one year beginning July 1st, 1920.

Our present membership numbers eighty-six and includes the majority of foremost amateurs of the Metropolitan District. Amateurs desirous of joining are invited to communicate with the Corresponding Secretary at 4903 Sixth Avenue, Brooklyn, N. Y. Communications by radio should be routed via 2JU (Clifford J. Goette, Traffic Manager).

E. O. & W. P. R. A. A.

The Eastern Ohio and Western Pennsylvania Radio Amateurs' Association was formed and started off with a splendid "get-together" convention of amateurs in New Castle, Pa., early in May. Rev. A. J. Manning, of 8DA, and Prof. H. W. Harmon, of 8YV, Grove City, Pa., gave interesting talks. In the election of officers, Rev. Manning was elected President, and R. J. McConnell, 8ADF, New Castle, Secretary. A club should prosper in their territory, and they have our best wishes for success.

RADIO CLUB OF BROOKLYN

The Prospect Radio Club, Brooklyn, N. Y., announces that it has changed its name to the Radio Club of Brooklyn, under which name it is now incorporated under the laws of New York.

The club has thirty-odd members, all having first-grade amateur licenses. Meetings are held every other Friday night at 4 Fuller Place in rooms kindly loaned the club by Mr. Warren Benson. This organization has been in existence over three years and kept active during the war by having weekly code practice meetings and lectures on theory and practice. Three members of the club have radio telephones, and several concerts have been given.

The club also has a social end—rather a unique feature in a radio club. Last October it celebrated its third anniversary with a dinner, and since then has had several stag parties. The first real radio dance in Brooklyn was held by this organization on April 30th at the Apollo Studio. The social feature has created an atmosphere of brotherhood which has served to tighten the bonds of the Great Radio Fraternity.

AMATEUR RADIO IN HOLLAND
By SEEFRED BROS.

MR. G. ROES, of Dordrecht, Holland, has given us some interesting information on Dutch amateur radio work, for the readers of the QST.

Mr. Roes tells us that Holland is as free a country as ours, but nevertheless transmitting is strictly prohibited. Without the privilege of operating a sending station, wireless would lose seventy-five per cent. of its attraction for an American amateur, but his Dutch colleague is only allowed to receive (a few semi-official experimental stations excepted) and even receiving stations have not always been permitted.

Before 1913, one was not allowed to operate any radio instrument, but after that time objections to receiving were removed. When the great war broke out in August, 1914, every station had to be dismantled. Although Holland had no part in the war, the authorities seemed to be very much afraid of radio, so even receiving apparatus was barred. In September, 1917, they were again permitted, and one could erect aerials of any size. A year later, Mr. Roes was the first amateur to receive the high powered American stations. With a single Dutch-made vacuum tube he heard NSS, NWW, NDD, and NFF. Shortly afterwards several reports came in from other amateurs who heard those stations, and at this writing every amateur is hearing them.

In long-distance short-wave work, Dutch amateurs have almost no experience

It will be interesting to learn that, up to 1916, audions were almost unknown in Holland. Mr. Roes bought a de-Forest T-tube when in New York in November, 1916; it remained the only V.T. in Holland until March, 1918, when Dutch-made vacuum tubes were put on the market by two or three firms, "Philips" tubes being the best

(Concluded on page 43)

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After that NSF-9ZN chess game, we won't be surprised when we hear of poker-by-radio. We suppose it's only a question of time until some bright lad will get up a code for matching pennies and shooting craps over the air.

Who has a good system for keeping a log? We would like to hear something on this subject.

A card to stations over 500 miles whom you hear will certainly be appreciated and will do more toward causing that particular station to improve his outfit than any other thing—it will create a genuine desire to get the maximum out of his apparatus. Do it.

After looking over the average monthly collection of current radio literature, we feel that we are continuing to be sincerely flattered every month. But there is only one A.R.R.L. and only one QST.

By the way, the A.R.R.L. fading tests are going to show the maximum transmitting range of some of our stations—in summer, at that.

Does it hurt to put the B battery through the filament of a tube? Goddard of North Dakota says it does. Any echoes?

Comply with the radio laws! Do you know that the Navy Dept. keeps a log of amateur activities so as to have data to show against us if it is ever needed? Keep down on 200 and whet up that wave—it will carry just as far—farther, even.

At the last meeting of our Board of Direction, Mr. C. R. Runyon, jr., of 2ZS, tendered his resignation as a Director on account of press of other duties—he has quit the radio game. We are sorry to see 2ZS out, but will not be at all surprised when the little bug bites him again.

Seefred Bros., 6EA, Los Angeles, have been copied many times this past season at an amateur station in Honolulu, Hawii, a distance of 2100 miles. Our congratulations! The Honolulu station reports audibility of signals about 7, using an 8-stage amplifier. Now for some Atlantic Coast station to get through to the Azores, about the same distance. East-bound ship operators, keep an ear out for some of us, will you?

We are pleased to see that the manufacturers of valves have recognized the amateur demand that a tube intended for detection be a soft tube with some residual gas. It's what we want.

The Alexanderson multi-tuned aerial has resulted in an immense improvement in the efficiency of high-powered stations. It should prove almost equally suitable for our work. Is any amateur experimenting with this system on 200 meters? If so, let us hear from you.

It pays to have your picture in "Who's Who". A lady in Wyoming or somewhere has fallen in love with Charlie Service's likeness. QST in the role of match-maker—we never even dreamed it!

They tell us nearly every member of the Radio Traffic Association of Brooklyn is wondering if his own particular Sweetie isn't the authoress of that recent letter in their Bulletin, signed "Helen", bitterly complaining about how nutty radio makes a chap.

Who's the recent new-comer in the long wave arcs? Bordeaux, we wonder? He seems never to sign.

Press dispatches from London tell of a wireless concert at the Chelmsford Marconi station, when Madame Melba sang selections in English, French, and Italian, her voice being heard, full and mellow, at Berlin, Paris, The Hague, Christiania, Warsaw, etc., over a radius of a thousand miles.

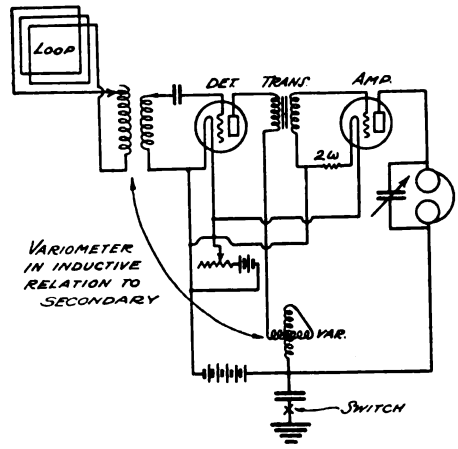
The Department of Commerce advises that preparation of the List of Radio Stations of the U. S. began on July 1st. It is not expected that it will be ready for distribution until some time in August or possibly September. It will contain Government, commercial, and amateur stations, and will be distributed by the Superintendent of Documents, as heretofore. The price cannot be determined until it is completed and the cost is known.

Dan Cupid has installed a radio set. On June 17th a girl in Detroit and a "gob" on

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the U. S. S. Birmingham, 1000 miles off the Californian coast, were married by radio. The young lady and her friends gathered in the church in Detroit; the minister telephoned the bride's side of the argument to a telegraph office where it went by Western Union to NAJ, Great Lakes Ill., thence by radio to the Birmingham in mid-ocean. After so long a time a uniformed messenger came to the church with the other half of the ceremony, upon reading which the clergyman declared the business complete, and the bride and her friends began the usual celebration. Next!

That list of calls heard on a 3-foot loop in Indianapolis, reported in June QST, is good work. Mr. Lowe has favored us with the hook-up, shown herewith; the loop is coupled to tuner circuits using tickler feed-back. The loop was located in a room 55 feet above street level, and consisted of five turns of No. 12 d-c c. wire wound on a frame three feet square, with the turns spaced ¾-inch apart. During winter the



audibility of received signals varied from 60 to 800, 1AW being received with an audibility of 400 on numerous occasions. The directional effect was of course very marked, and resulted in quite a reduction in local QRM.

The R. T. A. (Brooklyn) report the disappearance of one of their prominent members, rumor having it that he hitched up seventeen bulbs in an amplifier and a piece of static came along and knocked him flat.

The Atlantic Radio Company, Inc., have established a new branch store at 15 Temple Street, Portland, Maine. The branch will be under the management of Mr. H. W. Castner, who is a well known radio man in this area. This is the first branch store to be established by this progressive organization but others are looked for in a comparatively short time.

The Editor refuses to answer inquiries as to why the June QST had the cover it did.

The Boy Scouts of America are co-operating with the Navy Dept. in collecting addresses of amateur station owners. The Navy broadcasts from NAH, details of which were published in QST for October last, are particularly for the Boy Scouts. The information sheets mentioned in that article are being handled by the Scouts as a matter of public service. Any amateur interested can get full particulars from the nearest Scout headquarters or by addressing Armstrong Perry, Seascout Radio Commodore, B. S. A., 200 Fifth Avenue, New York.

Applicants for commercial radio license are now tested on their sending as well as their receiving. Transmissions by an applicant will be received by the examiner and also graphically recorded on a tape recorder. For first-grade commercial license, applicant must transmit satisfactorily for five minutes at 20 words per minute; and for second-grade commercial, at 12 per minute. We are glad to see this; experience has proved that just because a man can receive 20 per is no reason why he can send stuff at that speed that anybody else can read. It should materially improve the standard of the fists we hear on 600. Many of them need improvement.

THE HAM'S PSALM

QST is my Bible,
I shall not want another.
It maketh me to lie down after midnite,
It leadeth me to sleep on my instrument table.
It wirelesseth my soul.
It leadeth me into paths of sleeplessness for the relay's sake.
Yea, tho I monkey with my junk dangerously I fear no annihilation,
For thy "Don'ts" and thy "Warners", they comfort me.
Thou preparest a contest in the presence of mine enemy hams;
Thou anointest my dome with transformer oil.
My bulb, she spilleth over.
Surely Insomnia and Relayitis shall follow me all the days of my life and I shall dwell in my radio shack forever. AMEN.

HAROLD HUSTON,
San Fernando, Cal.

Errata in the article on "Constructing a 500-volt Rectifier Transformer for C. W. Work," in the June QST. Mr. Muns, the author, advises that to give the following secondary voltges, the stated number

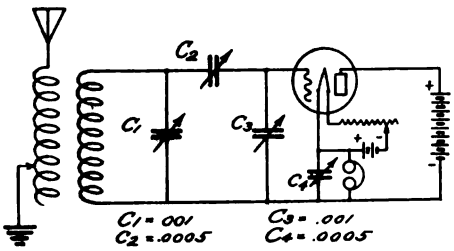
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of turns should be wound on each section of the secondary:

350	volts—	1300	turns
400	"	1480	"
450	"	1660	"
500	"	1850	"

Mr. R. H. G. Mathews extends a warm invitation to all radio men visiting Chicago during the coming Central Division Convention to make 9ZN their headquarters during their stay. A register of visitors and their stopping places will be kept, with bulletins of the various activities.

This is the pet hook-up of Mr. A. T. Hovey, of 1FT. Although a critical circuit, Mr. Hovey states it will amply repay the effort needed in familiarizing oneself with it, and is operative on either arc or spark from 200 to 20,000 meters. Condensers 2 and 4 are adjusted for regenerat-



ing spark stations, condenser 3 not being used except on very close stations. Although regenerative adjustments will also serve to cause oscillation, condenser 3 is used for this purpose, with finer adjustments for undamped signals secured by condensers 2 and 4 the same as for sparks.

New publications received. "Super Range Receiver", by M. B. Sleeper. No. 4 of a series of pamphlets on Radio and Model Engineering, published by General Apparatus Co. 4 pp., 8½" x 11". Complete directions and detail drawings for the construction of a tickler feed-back receiver to cover 6000 to 20,000 meters on antennas of .00045 to .001 mfd., employing Mr. Sleeper's well known system of unit panels. Good reliable dope.

WOULDN'T IT BE WONDERFUL—

If we smokers didn't always run out of matches about 1 a. m.?

If some of these radiophone operators would lose their false teeth for one night?

If Pacific Coast amateurs would quit knocking San Diego receiving stations when the latter have the big Poulsen arc at NPL to contend with all night long?

If printing presses didn't break down or something happen, so that QST could arrive everywhere by the fifth of the month?

If somebody would lend NRH a decremeter?

AMATEUR RADIO IN HOLLAND

(Concluded from page 40)

of them. He has sent us a small catalog describing these tubes. At the present time you can buy there any make of receiving tube you like. In 1916 the "Nederlandsche Vereeinging voor Radiotelegrafie" (Dutch Association for Wireless Telegraphy) was founded, having, in 1920, about 1500 members. The population of Holland is approximately six million.

Mr. Roes reports that a number of Netherlands amateurs are copying the Dutch stations at Tjililin (PKI) and Malabar (PKX), in the Dutch East Indies, on simple equipment. The distance is about 11,000 km., so that this represents very excellent work.

A HAM ON THE TELEPHONE

(Concluded from page 7)

"Hello." This from a male voice.

"Is this Mr. Stone?"

"Nope, wrong apartment."

"Well, what IS the matter with that operator?'"

"Wish the deuce I knew. I'd like to lay my hands on him for one minute. He's been raising h— with our phone."

At this the irrepressible Mr. Barney could no longer restrain himself and yelled

"De-de-de-dut-de-dut".

"There he is now!" Both voices.

"Well, cut out that QRM and I'll try to get the right party for you". James, of course.

"What?" cried the exasperated women, and the supposed Mr. Stone gently replaced his receiver.

"I sed QRX and I'll——"

"I'm a what?"

"Say, how do you get that way? I didn't say you were anything. I said QRX —" at this juncture the annunciators recommenced their vigorous rattling. James continued, "Say, I can't get you through this QRM. Better give me that on buzzer, Old Man".

"OLD MAN, SIR!! I'm going to complain to the company". CRASH!!!

That was enough for James. He gave a single hopeless glance at the dancing annunciators and ran. Then his common sense returning he did likewise. He carefully erased the record of his thirty-five cent call, and placing the headband of the phones in his pocket he again, with a dignified gait, made his exit.

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The Heterogeneropliodynatron

By Herbert Richter

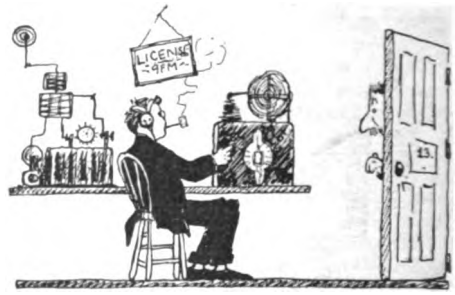
WE cussed the static, we did, Gonzl and I, whilst discussing the relative merits of various Corn Cures for warts on ears. Nothing doing on spark, so I threw the old contraption on arc, and "tout de suite" here was our old reliable, NSS, working away fine thru the static, about thirty-five per. "Too fast for me", thot I, and just then my partner Gonzl voiced the same sentiments. (Here's your chance, deForest: Thot transference works better with an audion oscillating two feet away; make a recorder.) Some one tapped at the door; I opened it, and in walked our janitor, Mr. Nicodemus Bolsch.

"Vel, can I see your vireless today?" he asked trepidously, "You know you said I could come up vunce some time and you would learn me all the things about it." "Sure, Old Man, sure," I answered, "Sit down and we will show you a thing or two about the old station; sit down."

I got the extra pair of phones and jammed them down over Bolsch's ears, at the same time pulling out, with the headband guaranteed never to catch a hair, nineteen of his remaining fourscore hairs and ten. "Now listen, Nicky, do you hear that in your receiver?" "Ja, ja, that visling sound, ja." "Well, that's station PDQ—you know every station has three letters for its name? Sure. Ours? Sure, ours here is, is—now what it it, Gonzl? Oh yes, to be sure, POZ. Now, you still hear that visling sound? Well, as I said, that's station PDQ over in northeastern Argentina; they're going to give a wireless concert. They give one every day. You know they can send music by wireless. Sh—sh—they'll begin in a minute now—here we are—", and with that Gonzl furiously worked the young variable under the table, and the concert was being given.

His fist soon got stiff, so he suggested we try something else. "All zu viel ist ungesund", he said, "As a German would say. You understand German, Nicky? Is that right! Well, what do you know about that, Pard; Nicky here can speak German. Say, is QRM still sending press? Let's see—".

Here he cut out some inductance and put in some more condenser, and here was NSS again, this time on a lower tone. "There now," I remarked, "That's station QRM over in Carnarvon, Iceland, sending —Iceland? Ja, ja, you're right, Bolsch, it's right up northeast there, just straight south of the North Pole. They are sending the world's news to Greenland now; guess I'll take down what they are sending." With that I stabbed a piece of paper and wrote down what they were sending (NSS was going thirty-five per, and twenty was absolutely the fastest I could handle then.) I wrote down news at least three weeks old, reading off as I wrote down; it was interesting; poor Bolsch "Bit". "It must be inderesting ven you can understand vunce vat dey are saying", he averred. Gonzl just winked, and I winked back; that's all we did, Gonzl and I.



"Now, Herr Bolsch, would like to hear some commercial messages? Let's tune in QRA, what say, Pard?"; this from Gonzl. "Sure, might as well; you hear something interesting once in a while." And soon we had NDD sending about ten words per minute and repeating, ready to put you to sleep. "Say, by Jupiter! but they're going some; guess you'd better take this down, Gonzl; too fast for me." Gonzl nonchalantly took a piece of paper, and here is what he wrote down: "Hr Vladivostokski Pr 41768 9/14 8:14½ Jan. 23—O U Nutshellopski, Noncomposmentis Street, Lunaville, U. S. Asked Lina for you; she says yes; Come at once. (Signed) Ike Amblotski." "There, that's all. Say, read that, Nicky, and—what ? can't read ? Well, hear me read it: Sent from Vladivostokski, No. 41768 9/14, at fourteen one half minutes after eight, January 23rd, 1920, to Mr. O. U. Nutshellopski who lives on Noncomposmentis Street in Lunaville—but say, Nicky, did you notice how long it took the message to get here? Just a minute and a half! Going some, eh, Nicky? Well, you know these wireless waves travel just 300,000,000,000 millimeters per second; quite some speed, eh? Oh, yes, the message. The message is: I asked Lina for you; she says Yes, I am yours. Come right away quick; she

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is waiting. The fellow who signed it was Mr. Ike Amblotski. There, that's all. Pretty nice, eh? Bet Mr. Nutshellopski is happy, eh?" "He, he, he," interpolated Bolsch, "do dey efen get married by vireless, hey? He, he, he." "Sure", I told him, "and any time you want to get married, just let us know, Nicky, and we'll do it for you by wireless. What? Oh, married once, that's enough, eh? Well, maybe you're right there, Nicky. But say, Bolsch, guess we'd better show you some of the separate instruments, since you've now heard the message themselves. You'd like to see them, not? Sure, thot so."

"Well, this is a deForest three-element oscillating vacuum valve radio detector (I pointed to the good old Audion, at the same time allowing a little blue glow to appear.) When you heat that filament, electrons fly off—you know what an electron is, don't you? Never saw one? Well! You know this word, look here, Nicky, e-l-e-c-t-r-o-n.

"'Elek', you know," explained Gonzl", means 'little', and 'trones' means 'chunk', so you see 'elektron' means 'little chunk, and that's what the electrons are, Nicky." "You see," I went on, "When you heat that filament, it gets too hot for them there and they fly off to that cold metal plate—see them fly? Ja, ja, right dere in dat blue part; see them chasing each other?" And finally Bolsch was convinced that he saw what no man ever saw before: an electron. "But dey are pretty small" he told us, "and vot is dis?" Here he pointed to our forty volt storage battery, "That? Oh, that's just our source of high potential current, which we use once in a while. But it only gives us a little over forty million microvolts, but then that's about as much as we generally need."

"Well," Gonzl went on, "This three element oscillating deForest vacuum valve radio detector you know can be made to



wiggle over a million times a second, so that—Did I count them? No, not I alone, but my partner here and I have done it together by—How? Oh, it's not so hard; there are several way of doing it, but we do it by means of some katabolical and metabolicalmathematical curves in connection with some metaphysical formulae. You understand, not? Not very well? Well, the next time we do it again we'll let you know about it, so you can come and help us; then you'll understand it all right." "Sure", I broke in, "We are making some new hyperbolical curves (our old ones broke) and then when we are thru we'll try again."

A 200 watt globular Mazda without a base lay on the table; we had stuck some tinfoil on it in a high frequency experiment. Bolsch pointed at and touched it—"Look out, look out, Bolsch," Gonzl quickly called out, "That's our Hetero-genero-plio-dynatron." "Ha? I tot it vos a tree-lemon os-os-osculating—vot did you called it?" "No, Nicky", I solemnly told him, "That is no vacuum valve as you suppose; it is our Hetero-genero-plio-dynatron, and it is somewhat dangerous to use it."

The Hon. Janitor backed up two feet.

"You see, it radiates waves of extremely short wave length—". "Extremely short," emphasized Gonzl. I went on: "Extremely short waves which may become quite harmful unless properly applied."

Bolsch was five feet away by this time.

"The danger, you see" (this from Gonzl) "Lies in the fact that most people know not how to use them." We followed him up here. "All short wave lengths become dangerous, Nicky, you know. But these however, are quite useful—." "Quite useful," I broke in this time. "Quite useful in treating certain diseases, especially such as pediculosis, and even more so if such treatment must be done by night. Ever have pediculosis, Nicky?" "N-n-no." "Well, anyway, would not advise you to use these extremely short wave lengths until you are thoroly acquainted with their dangerous properties."

Bolsch was two feet from the door by this time; we followed him up.

"Gonzl and I", I told him, "Have made a thoro study of this instrument and how to use it. Should you ever have use for this instrument, just call on us and we will show you how to use it. But look out for those extremely short wave lengths—".

Bolsch was outside of the door and had closed it; the Hetero-genero-plio-dynatron had done its work.

I flung myself into a chair; Gonzl simply stood and stared at me, then burst out laughing: "Guess we'll show him the Transmitter next time, if—Saprastieffel, we missed NAA time sigs altogether."

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Radio Communications by the Amateurs



THE PUBLISHERS OF QST ASSUME NO RESPONSIBILITY FOR THE STATEMENTS MADE HEREIN BY CORRESPONDENTS

REPLY TO MR. WASHINGTON'S LETTER

141 E. Fourth Street,
Waukegan, Ills., June 28, 1920

Editor, QST:

I must take issue with Mr. Washington in his criticism of the article by me published in the April number of QST. From a strictly technical standpoint there may be errors in the way some of the terms are used but insofar as I am able to judge, the matter in my article conforms strictly to the well known and generally accepted principles governing radio transmission.

In the first instance, maximum voltage is intended. An antenna radiates most effectively when operated at a voltage just under the brushing point and this in no way is contrary to the formula for determining the "radiation resistance", as in all cases with a given transmitter (which for the purposes of this letter will include antenna and ground as well as the instruments) it will be found that the ammeter reading is at maximum when this condition is attained. In one experiment where difficulty in transmission was encountered a long antenna was erected This was then turned carefully and results both as to radiation and signal strength at distant stations noted. Then this antenna was shortened by cutting off ten feet at a time till the antenna brushed so badly that shortening it further was obviously of no advantage. Each time the antenna was shortened the radiation as shown by the radio frequency ammeter increased, slowly at first and very much more rapidly as the brushing point was approached. When "brush" was first noticed a slight decrease in radiation was experienced and also a considerable increase in decrement. A further decrease in length resulted in a decided decrease in radiation and a decrement beyond the legal limit. Both radiation and decrement were better as the antenna was shortened and the betterment increased much more rapidly as the brushing point was approached. This was also true to a much more noticeable degree in the signal strength at distant stations. In these experiments a five K.W. 500 cycle transmitter was used.

Mr. Washington does not seem to take into consideration that in spark transmission, the energy per impulse (or per spark) and not the average value as shown by the radio frequency ammeter is what "makes the noise in the receiver". With a given power input it is certainly obvious that with equally efficient apparatus, each wave train at a low spark frequency will contain a proportionately greater amount of energy that when the same power is distributed among a greater number of wave trains in the same space of time. A tone can be no louder than the individual impulses of which it is composed, so the number of watts radiated have very little to do with signal strength except as they are in direct proportion to the effectiveness of the adjustments of the one particular transmitter on which the measurements are made.

As to radiation resistance. Quoting from pages 81 and 82 of the Circular of the Bureau of Standards No. 74, "The amount of power radiated depends UPON THE FORM OF THE ANTENNA, is proportional to the square of the current flowing in the current antinode of the antenna, and inversely proportional to the square of the wave length of the oscillation. Since the dissipation of power is proportional to the square of the current, it may be considered to be caused by an equivalent or effective resistance which is called the radiation resistance of the antenna Thus the radiation resistance of an antenna is that resistance which if inserted at the antinode of current in the antenna would dissipate the same power as that radiated by the antenna." May I point out that while the power radiated may be expressed by the formula quoted in Mr. Washington's letter it is DETERMINED BY THE SHAPE OF THE ANTENNA and it does not necessarily follow that increasing the number of wires in an antenna will increase the "radiation resistance"? In fact, actual experience shows that the opposite is quite often the case.

What Mr. Washington says concerning the effect of the charge of the conductor, etc., as to brushing, is correct insofar as it applies to the apparatus and the leads connecting it, but insofar as the antenna itself is concerned it is not of so great importance. When an antenna brushes it commences at the open end and as the power or voltage is increased the brush ex-

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tends further and further towards the transmitter. In many cases the leads to the transmitter will brush badly without any very great increase in decrement or falling off in signal strength and at the same time no brush effect can be detected on the antenna itself. But as soon as brush is noted on the wires of the antenna a decided decrease in signal strength will result and with it will be a fall of radiation and an increase in the decrement. It would logically follow that there is a limit to the power that an antenna will radiate and that this limit is the brushing point, as is well known to those familiar with the operation of high power arc transmitters.

Again quoting from the Bureau of Standards Circular No. 74, page 124, "On account of the skin effect, the series resistance in a condenser increases to some extent with the frequency." My experience with short wave transmission indicates to me beyond question that it does so increase and, as the shorter waves are used, increases "enormously". All amateurs are familiar with this difficulty in one form or another. A one K.W. transmitter can be operated on 600 meters with leads in the closed circuit so small that if they were used on 200 meters would decrease the efficiency of the set to such a point as to render it inoperative according to amateur standards. In my article, "ohmic resistance" was purposely used in distinction to "dielectric hysteresis," which in favor of the amateur does decrease as the frequency increases.

Mr. Washington's comparison of the results attained with his two transmitters is not convincing to me and I believe to the majority of the leading amateurs. Frankly, I'd like to see that 60 cycle set of his. All amateurs know the vast difference in range attained by different individuals with practically the same apparatus too well to form conclusions from such a test. However, the article in question was not intended to discuss the relative efficiency of 500 cycle quenched transmitters as compared to 60 cycle transmitters but rather to help each one get the best results from the apparatus he has. And the instructions and principles therein if carefully followed will not fail to achieve that result.

I believe that Mr. Washington will agree that it is an extremely difficult matter to write a non-technical article of the nature of the one in question and not leave oneself open to some criticism from a purely technical standpoint. The selection of proper terms in which to convey one's meaning is difficult indeed, as, for instance, the use of "ohmic resistance", to express the resistance in the conducting portions of a condenser. And I hope the apparently personal nature of this communication will be taken in the proper spirit, as no personal criticism of Mr. Washington or the opinions he expresses in his letter is intended or implied.

Very truly yours,
M. B. WEST.

QSP T. O. M.

Dear Eddy:

The Old Man seems to have overlooked one of the troubles of a modern radio bug. Perhaps he has as yet not tried to hook up a radiophone and make it **work**. He has something coming and we all want to hear about it when it does come. Friend Kitty will be drowned, the old pipe stem will be gnashed in two and some new cuss words such as Uggerdam and Wuffcoises will see publication for the first time.

Say, I wonder who this here Old Man is anyhow. I had a buddie in the army who knew a guy who heard somebody say he suspected the Old Man was one of those big station owners somewhere in Indiana or Illinois or maybe Oregon or Tennessee. Well, I have my suspicions it must be Illi**nois(e)** judging from all the local QRM and things he writes about. But then we have that right here in Ohio too. Up in Cleveland furinstance is about the best place to try out new ideas on barrage receivers and selective tuners I could imagine. Why up there there's so many hams who read the code off the charts on the wall as they go that it makes the old timers groan and wonder when the curfew will ring so they can get a whack beyond the city's walls with their own sets.

But one night while I was up there I started hearing some honest t' gosh radiophone stations working. Oh boy it was great. It took me just about no time to run down the station owners and begin getting details.

It looked easy. Just a small power bulb, a motor, a simple-looking generator and a few trimmings.

Back down at Akron in the spring another ham and I tried it out. We had everything we thot we needed and more too. Four kinds of bulbs, batteries, motors, generators, condensers, choke coils, tuning coils and meters. But would the darned collection get down to business and turn out sweet music? It would not. We coaxed, pleaded, tickled, oscillated, grid leaked, modulated, tuned, swore and everything. The best sound we could get was "Gr-wow-gr-whiz-s-s-s-woof-woof" or something like that. But after a while we got results—we did. We blew up a meter, a bulb and several condensers. This wasn't the result we were after but we'll try again this coming winter and then when it finally does get going we can give the laugh accompanied by sweet music of the Victrola to the next duck in Akron or Cleveland who

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first starts dabbling with radiophone.

In the meantime we wonder what the Old Man is doing. We'd ask you, Eddy, to slip us his name and address, only of course yuh mustn't shortcircuit the golden egg party at the market price that commodity holds at present. Cummon, OM, write us a article on Rotten Radiophones.

—DAH.

COURTESY DEMANDS IT

July 8, 1920.

Editor, QST:

I agree with you that an article in QST carries considerable prominence which somewhat compensates the writer for his labors. But this does not pay for the postage used in answering inquiries. I have received about thirty letters asking about the C.W. transformer described in your June issue and only one of them sent a stamped envelope.

Wouldn't it be in order to enclose a stamped and addressed envelope if an answer is expected?

Yours truly,
ROBERT MUNS.

(Mr. Muns is right. The least we should do, in requesting others to accommodate us with helpful information, is to enclose a stamped envelope for reply. Let us do so.—Editor).

AN OPEN LETTER TO S. W. DEAN
Koko Head Hawaii

Marion, Mass.

Dear Dean:

After reading all the compliments you gave me in our July issue of QST, I feel it a duty to write and thank you, and also to incidentally tell the World more about our little Rotary that quenched.

Before I do break into this detailed description of the cute little Rotary, however, I must pause and reflect upon past memories which the name Dean recalls. I don't recall the name of the son of this Mr. Dean whom I refer to now and here's hoping you've not the Son. . . . In years gone by this Mr. Dean took occasion to cut our telegraph line five or six times where it ran through his yard. Our "Board of Directors" held a meeting! Next night at 1 A. M. we made all arrangements and put the line in via the cable route **under** his property. The following night some rough boys tied a heavin' line on Mr. Dean's front porch railing and the railing left the porch. The Chester Hill Telegraph Co. could not be interfered with, if they had a hang their line on a Sky-Hook to get through.

Another Dean, the latest, is my next door neighbor. He's a Dean of some skirts' High School somewhere around here, and I have a smashing desire to soak his stove pipe silk hat down over his ears. When he walks by my radio station, you'd swear he had a ram-rod the full length of his back, and that his neck was made of the hardest steel. He's the nearest approach to six o'clock I ever saw. But, poor feller, I don't know's I blame him. His cause of worry is well established, for his little dinky electric light service is hooked up in multiple with my wireless shed, and we are both trying to bust the little one KVA step-down transformer that the lighting company so generously installed. When I slap the Key down and give the ol' United transformer all she'll take, she takes the biggest part of all there is on the line. To be exact, the voltage drops from 110 to 72. This is kinder tough on the dean's electric lights. To stand in the street and watch 'em, you'd say someone was trying to work a blinker signal.

The Dean's got a telephone. So have I. They are hooked in multiple too. As soon as operations begin on my key, the bell rings. No, not from a kick back, but 'cause said Dean is turning the crank. Being slightly interested in whether he's calling the cops or the Dept. of Commerce, and realizing that the telephone line is mine as much as his, I take the hook down am treated to the following: "Hello. Is this the electric light company?" "Yes." "That Man Vermilya's at it again. Now if I can't have electric lights that don't shimmy up and down every time that 'ohm chaser' takes a notion to squeeze all the juice out of my 'lectric light wires, I might as well have candles." Then I hear old Kill-joy Supt. of the lighting company pipe up: "Well, you See, Dean, we had Vermilya on a separate transformer but he blew it up. We are going to put him off by himself just as soon as we can get around to it." Then the Dean—"Well, for the love of mud, cut him off, can'tja? He's a pest." Here I hang up and call 2JU. No further interest develops for me. So now, my friend, I want to tell you all about that cute little quenched gap we had in the form of a rotary.

You are quite right—it was supposed to be a little trigger arrangement, just as you said. Only the bomfoozled thing wouldn't trig! We pulled and yanked at that trigger for a year or more and the only thing it shot off was the index finger on my left mit and the same thing on another feller's right hand. The only one that fooled it was Hammond—he got his coat tail in it one day and while he lost the tail very suddenly, still he had the satisfaction of bending several of the copper studs, which we failed to do with our fingers.

This rotary was driven by a 50 horsepower motor, and so geared that it ran twenty-one hundred a minute. The trigger disc was eight feet in diameter, with forty-

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eight copper studs on the outside edge. It sounded like the end of the world when it was running. It never ran over one hour, and by that time you could cook eggs on on the thrust bearings. The whole outfit was more or less of a Man-killing installation, any way. Connected to this rotary we had two, one-hundred-and-fifty K.W. 5,000 Volt D.C. Generators, three hundred K. W. total. If your main condenser, or the trigger condenser, broke down (and they did quite regularly,) it shorted these generators. Before the fuse and breakers blew, the machine "flashed over". Of all the shower of Sparks, Hot lead, Copper, Smoke, racket, and general riot, it was hard to beat the combination. We expected any minute to see the roof cave in on us.

Things are diferent now though, Dean—we've got all those past killers out in the lot, positively junk. The ol' quenched rotary's got a wire hooked on it and it's helping out the ground capacity. We've got two-hundred K.W. Alexanderson alternators there now, and there's not a place in the shack that you can lose your fingers or coat tails.

Don't suppose you'd like to believe it, but it's a fact—We've got one man here that went to put a fuse in on the 5,000 volt circuit one day and while standing on the iron frame work which was grounded to one side of the machine and ten feet above the cement floor, he got the full voltage 5,800 right thru between his feet and one hand. It flashed the machine over and threw him ten feet to the floor. Of course he talked about the "Blue Bells" for a week—completely lost—but today he's just as good as ever.

Today the only things that have any worries here are the bugs that fly into the Horn Gap which is on top of the alternator. This makes a flash and good-bye Mr. Bug. But there's no danger. The voltage of the alternator is only about 110. The flash cannot be heard, due to the frequency which runs as high as 27,000 cycles.

Some good-natured alternator attendant has tied a piece of cheese on this horn gap to catch these bugs, as he puts it. He claims that's what Alexanderson put it there for. Well I guess I'll go back to the Bakery and loaf. C U L.

"VN"

TO THE OLD MAN AND OTHERS

I have noted the apparently frantic attempts of many of the fellows to bring their radiation up, especially to the much to be desired (?) ten amperes on 1 KW on 200 meters. In the first place, I am going to be a knocker, and say that in general it can't be done,—not on 1 KW anyway. (Chorus of howls to the contrary heard, and all stations will pls QRT, and QRX.)

Now, in the first place what does the amperage determine? Apparently, it determines the power output. Yes, I admit that it does, but the wave length used also determines a few things. Suppose we take a purely hypothetical case of a station as follows:

Antenna—4 wires 50 feet long
T type,
20 meters high at each end
Leadin 55 feet long

Now suppose we are radiating 6 amperes on 200 meters from this antenna, with a decrement which will be somewhere near .2, at least. How much power are we actually putting in this antenna??? (The chorus of howlers are not so ready with their answers, I notice.) Well, if we take the following little simple formula, we can get an idea of how much we are getting:—

$$P = I^2 R$$

Where P is power in watts
R is radiation resistance in ohms
I is radiation in amperes.

Substituting,

$P = 35 \times 16$, for example
$= 456$ watts **in the antenna**

Where did the 16 come from, you ask? Well, that is the hazy ghost of an animal known as "radiation resistance", which we get from the formula:—

$$R = \frac{H^2}{\lambda^2} \times 1600$$

where
H = Height in **meters** of antenna
λ = Wavelength in meters of radiated wave
R = Radiation resistance in ohms.

Using the data given in the case of the antenna described above, we have

$$R = \frac{20^2}{200^2} \times 1600$$

hence R is 16 ohms.

Now I admit that this formula is not a very definite one, and that it is very liable to error, but it will be found accurate enough for almost all ordinary results. I will state in passing that a better method to get the radiation resistance is with a vacuum tube oscillator, by the "substitution method", where we set the oscillator going on the desired wave, and get the maximum radiation on the antenna; now switch the oscillator over to a circuit containing a big variable condenser and a variable, **non-inductive** phantom antenna resistance, and "juggle" the variable condenser until the maximum radiation is obtained with the resistance cut out. Now cut in resistance until the ammeter on the oscillator shows just the same amount of current flowing in the condenser circuit as was flowing in the antenna. Now find the resistance of the antenna resistance

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on a Wheatstone Bridge, and you have the radiation resistance of the antenna.

Suppose we have the radiation resistance of the antenna as above, it may be substituted for the R on the equation given.

Well, now who claims that they have a station whose overall efficiency is 45%? That's a pretty good station, I must say. Of course, I admit that it is possible. Well, now where is our 10 amperes?? Under the same conditions, as were given above:—

$P = 10^2 \times 16$
$= 100 \times 16$
$= 1600$ watts, **in the antenna**

Naturally, no well behaved station can radiate this on 1KW transformer primary input, and still be within the law. Do you get me??

It seems, therefore that the statements of some of these people who are claiming that they get these wonderful radiations on 200 meters are sadly mistaken in something. I will leave you fellows to figure out what. As a general rule, however, the chief liar around a radio station is the ammeter which is used in the antenna. Most everyone is using a hot wire instrument, and a greater liar never lived, especially when used on the extremely high frequencys used for Relay work. Of course, a good thermo-junction type of meter is what should be used, as it is designed to work on all frequencies, but in most cases an amplifier, storage battery, or a couple of new tubes must be bought before you spend any money on a new ammeter, especially when the old one you made from a disabled alarm clock still works.

As far as the efficiency of a set goes it can also be easily seen, incidentally, from the above formula, why a higher antenna is so much better than a low one when transmitting. Suppose we raise the antenna 10 meters, then our radiation resistance, as shown, is, substituting:

$$R = \frac{30^2}{200^2} \times 1600$$
$$= 36 \text{ ohms}$$

hence $P = 36 \times 36 = 1296$ watts.

If the power was kept the same we would have a lessened radiation with a high antenna, of course, instead of a raised amount of power.

The efficiency (?) of the average set is a thing that I hate to speak of. As a general thing the set is operated at a efficiency of something less than zero, tho it's more than that in some cases. The old Telefunken ship sets were rated as 0 5, and 1.5 "T.K.", literally "Telefunken Kilowatt", which meant 0 5 and 1.5 kilowatts in the antenna, respectively. The power transformers and motor generators were rated at a full one kilowatt, in the case of the 0 5 TK set, showing that they figured a total efficiency of 50%. Who is the amateur who claims his set is as efficient as a Telefunken used to be? It's lucky for the power companies, and for many house supply circuits that the U. S. Law states "No private station shall use a transformer input exceeding one kilowatt, etc." If it were not for this, I am sure that the regulations which the power companies have been adopting in various places would be **quite** strict, to say the least. The transformer input being limited to 1KW, it is up to the fellows to get all they can on this much power, and most of the transformers used by the amateurs are wofully inefficient. Judging as a general thing, I should state that an average of 25% is more like the efficiency of most of our sets, than even 50%, while more than 50% is surely unusual (tube sets excepted). Even with an efficiency of 75% overall, much more than 6.5 real amperes on 1 KW on 200 meters is pretty good, so where has the Old Man and his 10 amperes gone? Of course, I admit that some of you fellows 'way off a thousand miles from a radio inspector may do it, and the special stations will be able to get 10 amperes and even more than that on waves over 200 and with practically unlimited power authorized, but as far as the most of us getting 10 amperes, or anything like it,—well, just forget, and be satisfied with 5. CUL NM 73 OM.

"Prof. Bugs".

PERTINENT COMMENT

2712 Fremont Ave So.,
Minneapolis, Minn.,

Editor, QST:
The American Radio Relay League, Inc.
Hartford, Conn.

Dear Sir:—

In reply to an article entitled "Why is an Amateur?" which appeared in the December issue of QST, I am sending you my ideas on the subject.

I these days of supersensitive receivers many operators are able to work remarkable distances. But what is the result? Some eastern amateur has a message for some one in the west. Instead of trying short relays he burns up about an hour's worth of ether trying to raise some station in the middle west After raising a station he finds that communication is poor but does he try and shoot the message thru some closer station? Most assuredly not. He would rather repeat his message a dozen times and work a thousand miles than shoot the message a few hundred on the first crack. That is

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one of the earmarks of a "ham" and yet most amateur operators are guilty of this.

Another great fault is calling after having once raised a station. One call is sufficient under most circumstances but most amateurs call half-a-dozen times, make a few de's and then drag out their call, probably so some other amateur may get their call and then send them a postal.

It is surprising how many amateurs are ignorant of the conventional signals. Learn your International Signals and use them. Don't think because you have a list of them hanging on the wall and know QRM, QRN, QRS and QST, that is all there is to it. While most amateurs can work fairly fast and know a little about how to adjust their sets, when it comes to handling traffic in an expeditious manner, they are nil.

Most amateur stations where work is handled correctly are owned and operated by men who have done commercial or government work and should not be classed as amateurs but as radio operators. I believe that if an operator is an amateur call him an amateur, it sounds better than "ham", but, if he knows the game call him a radio operator.

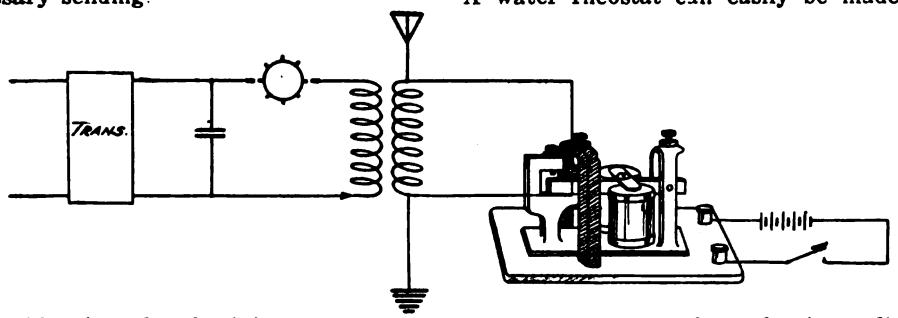
Yours truly,
R. J. Engler,
Formerly, Chief Electrician (R) U S.N.

BLINKING LIGHTS

Baldwin Park, Cal.

Editor, QST:

Among the Editorials for April, I notice one about the Power Companies. What u say about "buying out the company" is right to the point, and being much in the same boat as 8JQ, I tried out a stunt that does away with "blinking the lights." I might as well say that the light bill will take an awful jump, but even this has one good point, namely, the discouraging of unnecessary sending.



The idea is to let the juice run into the transformer all the time while sending, a switch being placed near the key to turn it on and off. The signals are made by opening and closing a shunt placed around the secondary of the oscillation transformer.

I have tried this out and it really works fine, and there is no blinking of the lights except when the power is turned on or off.

Everyone has an old telegraph sounder in the "junk box" and nothing better could be wanted. Mount a good sized contact on the lever about three-fourths of an inch from the free end. In the one I made, I made an entire new lever out of fibre, but I believe the metal one will do just as well.

Now cut out a yoke (fibre or bakelite) that will fit over the sounder and on which a contact may be mounted so as to make contact with the one on the lever when the lever is up. After the yoke is mounted adjust the contacts and adjusting screws so as to give as much up and down play to the lever as possible. Connect the ends of the secondary of the oscillation transformer to the contacts, using large size wire. Now connect up a battery in series with your key and the sounder, and there you are.

Start the transmitter and notice whether or not the current arcs across the points when the lever is down. If it does, it will be necessary to place the sounder in a bath of light oil.

I would like to hear from any one who tries this stunt out.

Yours truly,
M. F. ROSS,
6IS.

(Editor's Note: Another, and perhaps an easier method, is to shunt the key in the power circuit with a resistance of such value that the greater portion of the normal current flows through the transformer continually, and yet not sufficient in potential to cause sparking in the secondary circuit. The key then makes and breaks only the small additional current necessary to bring the current to normal, and blinking will be almost unnoticeable. A water rheostat can easily be made for this purpose—two electrodes in a slightly acidulated solution, with the resistance variable by adjusting the spacing between the electrodes.

Such expedients are recommended only where the blinking is caused by working off a line which is so heavily loaded that

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any intermittent load will cause noticeable voltage fluctuations, and where the trouble cannot be remedied by simply getting an independent power supply for the radio set. The most common cause of blinking is a poor power factor—drawing excessive amps. off the line in an effort to put in the desired number of watts. Restoration of the power factor is the best remedy—see an article by Mr. Mathews on page 5 of last December's QST, entitled "Transmitter Resonance".)

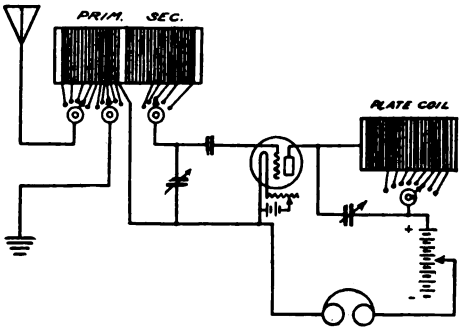
FOR 200 METER OPERATION

Danville, Va.

Editor, QST:

For simplicity of design and ease of construction, don't you think the accompanying diagram commends itself? Try it and see.

Primary and Secondary on the same tube, say, one that is 3", 3½" or 4" in diameter—Primary wound with No. 24 SCC wire, number of turns depending upon the size of aerials; Secondary wound with 80 turns No. 26 SCC wire, and tapped at 40th, 50th, 60th, 70th and 80th turns; Plate Coil 2½" in diameter, 100 turns No. 26 SCC wire, tapped at 40th, 50th, 60th, 70th, 80th, 90th, and 100th turns. Small variable condensers across Secondary, and Plate Coil, as shown.



There is nothing new in the design, but its simplicity should be refreshing.

Ordinarily, the primary should be wound with from 25 to 50 turns, tapped each turn for the first four, then every fourth turn.

The circuit will oscillate on any wave length, and with proper sized coils, the Foreign Stations may be received.

This set will appeal to those who are wrestling with the construction of complicated apparatus, and who are not equipped for the job.

Yours truly,
W. T. Gravely.

(Note—A series condenser in the antenna lead will increase the ease of tuning to short waves.—Editor.)

TELEPHONE INDUCTION

June 17, 1920.

Editor, QST:

Does any amateur know of some method that will stop the effects of induction from a transmitter going into the telephone mains without using the third wire system, one of the wires being grounded. The third wire has been tested out at this station and although it cuts a lot of the induction out, the neighbors still complain that they cannot use their phone.

It will certainly be disappointing to me if I cannot stop this trouble as I have just put my station into real working condition and, getting seven amperes out on the antenna now, would make an ideal relaying station this winter.

Well, OM, here's hoping that things come through OK. Thanks and 73.

Yours very truly,
E. G. CUNNINGHAM.
9AP.

ATTENTION CLUBS!

2043 North Twelfth Street,
Philadelphia.

Editor, QST:

It is desired by the officers of The Third Amateur District Convention to have all amateur organizations in the Third District communicate with them through their Secretary or President. Much work can be accomplished if this will be done promptly. It is planned that these organizations shall be communicated with in reference to the next meeting to be held in January or February, next, in Philadelphia. There is plenty of time to think this matter over during the summer, but when the fall once starts in, much will have to be done to get things started. Let us, therefore, have the names of all amateur associations, so that we can index them for use later on. We advise amateurs to organize everywhere and if possible to get in affiliation with the A. R. R. League. If only five or ten fellows unite to form a club or association it is better than nothing at all. Much splendid work can be accomplished by this union of mutually inclined wireless enthusiasts QST will keep you informed as to what is going on relative to our Convention. Let us know, however, in the meantime, who you are and where you are.

GORDON M. CHRISTINE, M D.,
President Third District Amateur Convention.

(This movement has the hearty approval of A.R.R.L. Headquarters, and Third District clubs are requested to communicate with Dr. Christine with the view of co-operating in making the next convention even more successful than was the first one.—Editor).

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XAJ—SOME STATION!

234 Vine Street,
Milton, Pa.

Editor, QST:

QST writers, etc, have given us many a fine article on "Short Leads in Your Transmitter." I am a short lead fiend myself, but please explain this one.

About a year and a quarter ago I happened one day to be wandering down the streets of old Tampico, Mexico, in vain search of booze. I neared the old cathedral (everything is "old" down there, you know). Somehow, something did not look just right for a cathedral. Sure enough, there was a 'T' type strung between the two domes, or wat you call 'em. And she had some neat little porcelain insulators on each wire end.

"At last", I thot, "a Mex ham to handle our MSG's that way out", and at once decided to look him over. After some back-alley stuff I found myself in a large room with a two-year-old auto-shooter smiling in my face and a husky Mexican in the outfield. It didn't take me long to assure my friend that I was a perfectly harmless and lonesome human. (I didn't have the heart to beat it.). After considerable explaining that I did not have time to see the President and seven or eight other high-brows to obtain required passes and the like, we established fairly good understanding that I was a "Radio-Girl" myself and was there to pay him a friendly visit and not running a counter-revolution.

Naturally the first thing I asked him his name, his standing, and if he owned the mass of junk hung on the walls and elsewhere. His name I can't write on this mill, but he said he was Chief Operator, Junior Operator, etc. In fact, he was everything. "The station", he put it, "belongs to the government today, but tomorrow h—knows who."

So this was XAJ, whom we copied in the States on one bulb and across the gulf on galena.

Here is where the jolt comes in. The transmitter was an old Telefunken. He said 2 KW, but my limit on German from the name plate on the transformer told me he lied by 1½ KW. I am sure he did. Even at 2 KW, with the leads he had I wondered how old kid NDH, lying a mile away, could hear him even with his old two steps. Oh Boy, that half KW covered no less than a hundred square feet of wall space and the same on the floor (I forgot to look on the ceiling), and leads of anything from bell-wire on up, but mostly the former. And enough of it to make 1AW a twenty-seven wire aerial and a counterpoise too. Mixed up and twisted together and then some. His antenna lead was approximately three times as long as his antenna. I'll give him credit, though, that his ground lead was fairly short (he installed it, he said) but it was not due to his efforts—it was merely the handiest one.

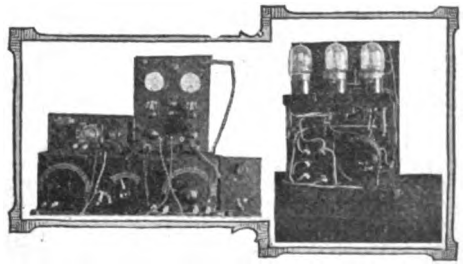
Sorry, but he just would not allow me to photograph the set, or I would send you one to convince you that someone is wrong on this LEAD question. Can any of the gang account for it? Across the gulf of galena and in the States on one tube, with a mile of bell-wire in your oscillatory circuit! I can't.

GN and CUL 73.

HERBERT M. WALLEZE, 8BQ,
Traffic Asst., Cent. Pa. Dist.,
Ex-WCUI (now on the bottom)
Ex-KTE (should have been ten years ago).

CONCERTS de 2AB

Amateurs in the vicinity of New York were recently treated to a concert of dance music transmitted by radiophone from Station 2AB for the benefit of the Radio Club of Brooklyn, some fifteen miles away, where loud speakers were placed in the hall and the radio music received as loud as an orchestra which furnished the alternate dance numbers.



Our photograph shows the apparatus, which was all constructed by its owner, Mr. Morton W. Sterns. This set delivers about 15 watts to the aerial, and has done remarkable work for this power having been reported in every state this side of the Mississippi River and has made two records in excess of 1300 miles.

2AB is sending out regular concerts on Friday evenings at 8 and Sunday mornings at 11 o'clock, and would be glad to have reports from stations over 100 miles distant.

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CALLS HEARD

THE Editor has received a number of letters recently, expressing disappointment that the writers lists of Calls Heard have not appeared in QST. We want to tell you fellows how that happens. All lists are filed as received, and periodically certain of them are taken off for publication. We have only two pages we can allot in QST to this department, and we do not believe that the quantity used for one issue has ever been one percent of the amount we have regularly on hand. The lists in our office right now would be sufficient to fill several thousand pages in QST! With such a quantity to labor thru the best we can do is to see that the selections published in each issue embrace reports from every section of the country—it is manifestly impossible to publish them all at once. We will do our best to present all the interesting lists. Be assured of our cordial appreciation of your kindness in reporting.

On account of the vast quantity of calls reported we must ask your co-operation in the following.

(1) List the calls on a separate sheet of paper—do not embody them in a letter.

(2) Arrange by districts from 1 to 9, and alphabetically thru each district; and run them across the page, not down a column.

(3) Put parentheses around calls of stations also worked.

(4) Omit initial or other unauthorized calls.

(5) State the period covered by your report.

1AW, HARTFORD, June 1—July 10

(1AE), (1AZ), (1CE), (1CK), (1CM), 1DQ, 1FH, (1FQ), (1FV), (1GY), 1MX, 1SN, (1SZ), (1TS), (1AES), 1BBH, (1BBL), 1FAQ, (1HAA), (1NAQ), 1TAZ, (1VAD), (1VAK), (2AO), (2BK), 2FS, 2GR, (2JU), 2OM, 2TF, (2YM), 2XJ, (2ZV), 3EN, 3EV, 3HJ, (3KM), (3NB), (3ZA), (3ZW), (NSF), 8BB, (8BP), 8CB, (8DA), (8ER), 8IK, (8WY), (8XK), (9ZN).

8EJ, ANN ARBOR, MICH.

1AT, 1AW, 1AZ, 1RN, 2BM, 2DA, 2II, 2IR, 2LO, 2XG, 2YH, 2ZM, 2ZS, 2ZV, 3AA (Can.), (3AR Can.), 3BP, (3DH Can.), 3DM (Can.), 3DR, 3EG (Can.), 3NB, 3NC, 3XF, 3XP, 4BZ, 5BT, 5ED, 5YA, 5YE, 5ZO, 8AA, 8AAI, 8AB, 8ABP, 8AG, 8AH, 8AI, 8AL, (8AM), 8AMN, 8AO, 8AP, 8AS, 8ASF, 8AU, 8BA, 8BG, (8BO), 8BP, 8BR, (8CB), (8CF), 8CH, 8DA, 8DC, 8DE, 8DF, (8DI), 8DO, 8DV, 8EN, 8EO, 8ER, 8EX, 8FD, 8FI, 8FS, 8FX, 8GC, 8GE, 8GN, 8GQ, 8GR, 8GY, 8GZ, 8IE, 8IH, 8IK, (8IR), 8KA, 8KB, 8KH, 8KK, 8KV, 8JJ, (8LA), 8LE, 8LS, 8LU, 8MT, 8MY, 8OZ, 8PF, 8PX, 8RA, 8RM, 8RN, 8SF, 8TN, 8UW, 8VB, 8VP, 8VR, 8WI, (8WY), 8XC, 8XI, 8XK, 8XU, 8YF, 8ZL, 8ZV, 8ZW, 9AK, 9AP, (9AU), (9CA), (9CE), 9EE, 9EV, 9FG, 9FH, 9HA, 9HJ, 9HN, (9HR), 9HW, 9IT, 9KF, (9KM), 9KV, 9LC, (9LF), (9MH), 9MK, (9NQ), 9QJ, 9RP, 9UG, 9YA, 9YB, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZT.

1ES, BROOKLINE, MASS.

1AW, 1CM, 1FQ, 1HAA, 1TS, 1YB, 1ZA, 2BK, 2BM, 2BO, 2GR, 2JE, 2JU, 2LO, 2OA, 2RB, 2TF, 2VA, 2XH, 2XX, 2YM, 3BZ, 3DH, 3EN, 3EV, 3EY, 3FG, 3GX, 3HJ, 3KM, 3NB, 3NV, 3ZA, 5CW, 8ABG, 8CB, 8DA, 8DC, 8DI, 8DY, 8EN, 8ER, 8EV, 8FO, 8GB, 8HW, 8LA, 8MT, 8NI, 8PG, 8RQ, 8RS, 8VM, 8WY, 8XK, 8XU, 8YV, 9MH, 9ZN.

9LR, ANTHONY, KANSAS

4AG, (5AA), 5AC, 5AL, (5AO), 5AP, 5BB, 5BM, (5BO), 5BZ, (5CD), 5CP, (5DO), (5EA), 5ED, 5EE, 5EO, 5EW, 5FL, 5FW, 5HB, 5LL, 5SB, (5YA), 5YE, (5ZA), 5ZC, 5ZG, (5ZL), 5ZN, 5ZO, (5ZU), 5ZW, (5ZV), 6GQ, 6ZA, 8AA, 8DA, 8ER, 8GQ, 8RS, (9ACV), 9AJ, (9AK), 9AU, 9BR, (9BY), 9CA, 9CI, (9CN), 9EE, 9EL, 9FL, (9FP), (9FU), 9GK, 9GM, 9GU, 9HA, 9HB, (9HI), (9HN), 9HT, (9IF), 9IV, 9JB, 9JD, (9JE), (9JN), 9JT, 9KA, 9KO, (9KV), (9LC), (9LF), 9LQ, (9MK), (9NE), 9NQ, 9OT, (9OV), 9PL, 9QM, (9RP), 9SD, 9SV, 9UG, 9WI, 9WU, 9XM, 9YO, 9ZA, (9ZC), 9ZH, 9ZJ, (9ZL), 9ZN, 9ZQ, 9ZS, (9ZT), (9ZU), 9ZV, 9ZX.

6DH, FRESNO, CALIF.

5AC, 5ZA, 6AB, 6AC, 6AD, 6AE, 6AG, 6AK, 6KM, 6AT, 6AY, 6BH, 6BQ, 6BR, 6BS, 6EE, 6CM, 6CO, 6CQ, 6CV, 6DP, 6DY, 6EA, 6EB, 6ED, 6EF, 6EJ, 6EL, 6EM, 6EN, 6ER, 6FE, 6FS, 6FU, 6GE, 6GH, 6GI, 6GQ, 6HM, 6HH, 6HZ, 6IF, 6IQ, 6JD, 6JE, 6JK, 6JM, 6JQ, 6JS, 6KP, 6KU, 6LE, 6MH, 6MZ, 6NL, 6ZA, 7BR, 7CC, 7CK, 7CH, 7CW, 7CU, 7DF, 7VA, 7YS, 7YB, 7ZB.

9FG, GOSHEN, IND.

1AW, 2ZS, 3ZR, 4AE, 4AL, 5BT, 5YA, 5YE, 5ZL, 8AA, 8AK, 8BP, (8DA), 8DI, 8EA, 8EB, 8FI, 8FS, 8HA, 8HD, 8IC, 8IF, 8IK, 8LA, 8ER, 8MB, 8NI, 8NZ, 8RK, 8XI, 8ZY, 9AA, 9AJ, 9AP, 9AU, 9AW, 9BA, 9BG, 9BR, 9BY, 9CA, (9CI), (9DF), 9EE, 9ER, 9FD, 9FN, 9FW, 9GD, 9GS, 9HD, 9HJ, 9HN, 9IP, 9JW, 9KO, 9LF, 9LQ, 9MH, 9MV, 9PA, 9PR, 9PW, 9XM, 9YA, 9ZJ, 9ZL, 9ZN, 9ZQ.

8NB, ROCHESTER, N. Y.

1AK, 1AW, 1TS, 2DA, 2FH, 2IR, 2JU, 2NR, 2QE, 2RM, 2ZL, 2ZM, 2ZR, 3EV, 3GX, 3NB, 3NH, 3NV, 8AA, 8BB, 8BG, 8BH, 8BV, 8CH, 8CB, 8CO, 8DA, 8EG, 8EN, 8ER, 8FO, 8GA, 8GS, 8HH, 8IK, 8KI, 8KP, 8KW, 8MU, 8MZ, 8NG, 8NI, 8PG, 8PP, 8QJ, 8SH, 8VM, 8XA, 8XK, 8XU, 8ZM, 8ABG, 8RBG, 9AU, 9GB, 9LQ, 9MS, 9NB, 9XH, 9ZJ, 9ZN.

6ED, SANTA ANA, CALIF.

5AC, 5ZA, (6AE), (6AH), (6AK), 6AM, 6AN, (6AT), (6AY), 6BF, 6BH, (6BQ), (6BR), 6BS, 6BU, 6CC, 6CM, (6CO), 6CP, 6CV, (6DA), 6DF, 6DP, 6DX, (6DY), (6EA), (6EB), (6EC), 6EF, (6EI), (6EJ), (6EK), (6EN), 6ER, 6EX, (6EZ), 6FA, 6FD, 6FN, 6FS, 6FT, 6FU, 6FY, 6GC, 6GH, 6GI, 6GM, 6GQ, (6HH), 6HO, 6HU, 6HY, (6IF), (6IL), (6IY), (6JD), (6JI), (6JK), 6JM, 6JR, 6JV, (6KA), (6KE), (6KH), 6KL, (6KP), 6LC, 6LQ, (6MN), (6MZ), 6NB, (6NY), 7AD, 7DK, (7CC), 7ZB, 7YB, 7CU, 7CW.

9ZT, MINNEAPOLIS, (Feb. 1st—April 15th)

9AAH, 9AAN, 9AB, 9AC, (9ACV), (9AD), 9AE, 9AG, 9AI, (9AJ), 9AN, 9AS, 9AT, 9AU, 9AV, 9AX, 9BG, (9BR), (9BT), 9BU, (9CA), 9CC, (9CE), 9CH, 9CN, 9CS, 9CT, 9CV, (9CW), 9CY, 9DB, 9DC, 9DD, 9DL, 9DN, 9DO, 9DT, 9DU, 9EA, (9EE), 9EK, (9EL), 9ET, 9EX, (9FB), 9FG, 9FI, 9FK, 9FL, (9FP), 9FQ, 9FT, 9FU, 9FZ, 9GA,

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(9GC), 9GG, 9GH, (9GK), (9GM), (9HI), (9HN), (9HQ), (9HT), 9HW, 9HY, 9IF, 9IJ, 9IL, 9IP, 9IR, 9IT, 9IX, 9JA, 9JE, 9JI, 9JJ, 9JL, (9JN), 9JQ, 9JT, 9KG, 9KI, (9KM), (9KO), 9KR, 9KV, 9KW, (9LC), 9LF, (9LH), (9LR), 9LT, 9LY, 9MC, (9MH), 9MM, 9MS, (9MX), 9NG, 9NO, (9NQ), (9NX), (9OB), (9OE), 9OG, (9OV), 9PF, 5ZA, 5ZK, (5ZG), 5ZL, 5ZU, 3DH, 3EM, 3ET, 2XB, 2XG, 1AW.

8ER, ST. MARY'S, O., May 19—June 21.

1AK, (1AW), 1FW, 1HAA, 2BM, 2EJ, 2GR, 2JU, 2TF, 2UE, 2VM, 2ZM, 2ZV, 2BZ, 3EN, (3HJ), (3NB), 3ZW, 4AE, 4BZ, 4YA, 4YB, (5DA), (5DA), (5YH), 5ZG, 5ZL, 8ADO, 8BJ, 8BP, (8CB), (8DA), 8DV, 8EJ, 8FD, 8FY, 8GS, (8IK), 8IN, 8RS, 8UO, (8WY), (8XA), 8XB, 8XK, 8YV, 8ZV, 8ZW, 9AP, (9AU), 9BW, (9CA), 9DP, 9GX, 9IX, (9JN), 9KV, 9LM, 9MH, 9UK, 9UM, 9UU, (9ZC), 9ZL, (9ZN), 9ZX, (NSF), XA3. The following were heard in daytime on June 6, 7 and 8: 1AW, 8DA, 9ZN, NSF.

3EN, NORFOLK, during June.

1AW, (2BM), 2GR, 2JU, (2RK), 2TF, 2ZM, (3BZ), (3DH), 3HJ, 3IB, (3KM), 3NB, (3ZA), (3ZW), (NSF, fone & CW), (4CC), 8BP, 8DA, 8DI, 8ER, 8LA, 8WY, (8XK, spk and CW), (8ZW), 9ZN, and 9ZW.

3HJ, HAVERFORD, PA, June

(1AW), 1BM, (1CE), 1DU, 1FAQ, 1FV, (1SN), (1TS), 2AJD, (2ANN), 2BR (dalite), (2CT), (2ME), (2NP), (2OA), 2RK, 3DG, (3DK), (3EN), (3HG), 31H (cw), (3JR), (3KE), 3QC, (3XF), NSF, (8ABG), (8ER), 8IN, (8JU), (8NI), (8RQ), (8VX), (8ZW), 9HR.

9ZC, BAUDETTE, MINN.

2XG, 5AL, 5BT, 5DO, 5TU, 5ZA, 5ZC, 5ZG, 7CC, 7ME, 8AA, 8DA, (8ER), 8FI, 8MQ, 8XK, (9AK), 9AO. 9AW, (9AU), (9AJ), 9BT, (9CS), 9DA, 9AF, (9DH), 9DR, 9DT, (9EE), 9EX, 9EY, 9FA, 9FT, (9FZ), (9GC), 9HA, (9HN), 9HT, (9HW), 9HT, 9IX, 9JA, 9JB, 9JE, 9JR, (9KI), (9KF), (9KV), (9LC), 9LU, 9LW, 9MH, ex 9MK, (9PI), 9RP, 9TU, 9UG, 9WW, ex 9XN, 9YA, ex 9YG, (9ZN), (9ZJ), (9ZL), (9ZU), (9ZV) and (RCW of the Radio Cub of Winnipeg, Man.)

6CR, LOS ANGELES.

5ZA, 6AE, 6AK, 6BJ, 6BN, 6BQ, 6BR, 6CP, 6CQ, 6CS, 6DK, 6DP, 6DS, 6DY, 6EJ, 6EX, 6FE, 6FI, 6GE, 6GK, 6GQ, 6HH, 6IY, 6JI, 6JK, 6KC. 6KM, 6KZ, 6MZ, 6OH, 6QU, 6UM, 6XZ, 6ZA, 6ZE, 7CC.

2KV, BRONXVILLE, N. Y. Mar. 1—June 30.

1AE, 1AS, 1AW, 1BB, 1CK (Daylight), 1CM, 1DL, 1DQ, 1DR, 1DY, 1FAA, 1HAA, 1HH, 1HT, 1HW, 1JA, 1JAP, 1LD, 1NC, 1OAL, 1RN, 1RZ (Daylight), 1TS, 2AJW. 2BM, 2DA, 2FG 2TF, 2SZ (Daylight), 3AW, 3BE, 3BZ, 3CT, 3CK, 3CV, 3DH, 3DQ, 3DR, 3DS, 3EE, 3EH, 3EN, 3EV, 3EW, 3EZ, 3FB, 3FG, 3FR, 3FW, 3GI, 3GO, 3GV, 3GX, 3HG, 3HJ, 3IF, 3KM, 3NB, 3NS, 3NV, 3OA, 3OB, 3OF, 3OU, 3RK, 3SB, 3SF, 3SJ, 3UE, 3UG, 3VA, 3VN, 3WF, 3ZA, NSF, 4AO, 4AT, 5BS, 5DA, 5GA, 8AJ, 8AS, 8BB, 8BO, 8BQ, 8CB, 8CE, 8CT, 8DA, 8DD, 8DK, 8DR, 8DW, 8DY, 8EL, 8EN, 8ER, 8GB, 8GI, 8HH, 8HP, 8IB, 8KZ, 8MQ, 8MT, 8NI, 8OT, 8PG, 8RS, 8SS, 8SH, 8WY, 8XK, 8ZM, 9CA, 9CC, 9DD, 9FZ, 9HA, 9IK, 9IT, 9KV, 9ZM, 9ZN, 9ZO, 9ZV. Canadian 2BF.

8IK, ASHLAND, OHIO.

5AL, 5ZL, 5ZC. 5DO, 4AG, 4AA, 8BZ, 8CC, 8CH, 2DA, 2ZS, 2ZM, 2ZL, 2IR, 2JU, 2WB, 2CS, 2ZP, 2WP, 1AZ, 1AW, 1AK, 9's and 8's too numerous to mention.

8LF, CRAFTON, PA.

(Indoor aerial, one 40 ft.-wire, May.), 1AK, 1AW, 1TS, 1HAA, 2BG, 2BM, 2BW, 2DR, 2OA, 2QR, 2TF, 2ZL (spark and Mod.), 3BE, 3ED, 3EN, 3EV, 3FG, 3HJ, 3NV, 3PK, 3ZW, 4YA, 8BP, 8CB (Spark and Mod.), 8DA, 8DI, 8DZ, 8ER, 8FD, 8GC, 8HG, 8HP, 8LA, 8RS, 8TG, 8TI, 8TT, 8WY, 9AFX, 9AMN, 9BP, 9FW, 9HR, 9JN.

(9PI), 9PN, 9PS, 9PV, 9PY, 9QE, (9QV), 9QY, 9RB, 9RF, 9RG, 9RK, (9RP), (9RV), (9RY), 9SC, 9SR, (9SS), (9SY), 9TA, 9TQ, (9UG), 9UK, 9UQ, 9VR, 9WD, 9WW, 9XA, 9XN, 9YA, 9YN, 9YO, 9YV, 9ZA, (9ZC), 9ZJ, 9ZN, 9ZP, (9ZQ), (9ZU), (9ZV), (9ZX), 9AE, 8AL, 8BB, 8BP, 8BV, 8CB, 8CD, 8CI, 8DA, 8DC, 8EA, 8EN (Heard at noon April 5th), 8ER, 8FH, 8FI, 8FP, 8GA, 8GB, 8HA, 8HH, 8IF, 8JB, (8JJ), 8MB, 8NB, 8NC, 8ND, 8NF, (8NZ), 8PJ, 8PL, 8PV, 8QI, (8QJ), 8RH, 8RS, 8SS, (8WY), (8XA), 8XD, 8YO, 8ZG, 5AG, (5AL), 5BB, 5BG, 5BM, 5BO, (5BT), 5CP, 5DA, 5DG, 5DO, 5ED, (5EJ), 5EW, 5NA, 5YA, 5YE,

1AAU, PROVIDENCE, R. I.

1AE, 1AW, 1CK, 1CM, 1FQ, 1GAI, 1HAA, 1JP, 1NR, 2BM, 2BK, 2DA, 2EV, 2GR, 2IT, 2JU, 2LO, 2RM, 2TO, 2VA, 2XH, 3BB, 3BH, 3EN, 3EV, 3GK, 3HJ, 3NB, 3ZA, 8BB, 8BQ, 8DY, 8EN, 8EV, 8FC, 8GI, 8H, 8IK, 8KX, 8LA, 8MT, 8PP, 8WY, 8XU, 8ZV and NSF.

1TS, BRISTOL, CONN., May 18—June 20.

(1AAT), (1ABJ), 1AE), (1AK), 1AS, (1AW), (1AY) spark, mod. c. w. & fone, 1BAY, (1BB), (1BBL), (1BG), 1BM, 1CAO, 1CC, 1CE, (1CK), (1CM), (1CZ), (1DAB), 1DAL, (1DQ), 1DR, (1DY), (1EAV), (1ED), (1EK), 1EP, 1FQ, (1FV), 1FW, (1GAI), (1GP), (1GY), (1HAA), 1IL, (1IS), 1IW, (1KAY), (1KAZ), (1NAQ), (1NAT), 1QN, (1OP), spark, mod. c. w. & rone, (1RV), (1RZ), (1SAS), 1SAZ, 1SE, (1SN), (1SZ), 1TX, 1UAF, 1WP, (1YB); 2ABM, (2ANN), 2BA, (2BK), 2BM, 2CL, 2CM, 2CS, 2DR, 2EV, 2FB, 2FG, (2GR), (2JE), (2JU), 2LO, 2ME, (2OA), 2OM, 2PL, 2QR, spark, c. w. & fone, 2QV, (2RB), 2RM, 2RU, 2SZ, (2TF), 2TS, 2VA, 2XJ, c. w. & fone, 2ZE, 2ZL mod. c. w., 2ZM spark, straight & mod. c. w., 2AIM, (2AJD); 3AN, 3AQ, 3BZ, 3DH, DR, 3DS, 3EN, 3EV, 3FB, 3FG, 3FN, 3GV, (3HJ), 3MU, (3NV), 3OB, 3PR, (3NB), 3ZA, 3ZW, 8ABG, (8BB), 8BP, 8BQ, 8BV, 8CB, 8CD, (8DA), 8DI, 8DY, 8EN, 8ER, 8FW, 8GB, 8GQ, 8GS, 8HA, (8HP), 8IN, 8JY, 8KZ, 8LA, 8LJ, 8MM, 8NI, 8QJ, 8SH, 8TT, (8WY), 8XK spark, mod. c. w. & fone, 8XU, (8ZW), 9AU, 9HR, 9ZN.

9LU, MORRISON, ILL.

"NSF", 2ZS, 2ZM, 3BZ, 3EN, 3HJ, 3NV, 3NZ, 4BC, 5AO, IBT, 5CP, 5DO, 5YA, 5ZL, 5ZP, 5ZW, 8AA, 8AM, 8CB, 8CI, 8DA, 8DE, 9DG, 8DR, 8DS, 8EN, 8ER, 8FH, (8FI), 8GB, 8CJ, 8HD, 8HH, 8IA, 8IF, 8IK, 8IU, 8IS, 8JL, 8JO, 8KP, 8LA, 8LH, 8LS, 8MY, 8NF, 8NI, 8NT, 8NZ, 8PP, (8QJ), 8RA, 8RY, 8RS, 8ZS, 8XA, 8XK, 9AJ, 9AF, 9AK, 9AT, 9AX, 9AU, 9AW, 9BA, 9BE, 9BR, 9BP, (9BY), (9CA), 9CE, 9CN, (9CS), 9CW, 9DR, (9DC), (9DT), 9EE, 9EQ, 9ET, (9EZ), 9FA, 9FG, 9FU, 9FZ, 9GA, (9GM), (9GC), (9GR), 9GF, 9GS, 9GP, 9GX, 9HN, 9HA, 9HJ, (9HK), 9HT, 9HD, 9HI, 9HW, 9HR, 9HM, (9IA), (9IX), 9IJ, 9IT, 9ID, 9JT, (9JN), 9KF, 9KK, (9KI), (9KY), 9KV, 9KQ, 9KL, 9KX, 9KM, 9LC, 9LV, (9LF), 9LR. 9LK. 9LA, 9LX, 9LI, 9LO, (9MS), 9ME, 9MT, (9MN), (9NQ), (9NV), 9NY, 9NX, 9NE, 9OK, 9OE, (9PZ), (9PI), 9PV, (9QI), 9QJ, 9QQ, 9RK. 9RP. 9SJ, 9SS, 9SC, 9SU, 9UW, 9UK, (9UG), 9VA, 9WD, 9XM, 9YA, 9YB, 9YO. 9ZJ. 9ZN, 9ZS, 9ZU, 9ZT, 9ZL. 9ZK, 9ZG, 9AAV, 9ABN, 9ACN, 9AFB, (9AFF), 9NNA.

9QJ, ST. LOUIS, May 15—June 15.

3EN, 4BZ, 4AZ, 5AC, 5AL, IOA, 5YA, 5ZA, (8ER), (8DA), 8DI, (8LA), 8MI. (9AU), (9CA), (9CE), (9EL), (9OS), (9HM), (9HM), (9KM), (9MH).

2TF, SCHENECTADY, April 27—June 10.

Stations worked: 1AK, 1CK, 1DR, 1DQ, 1DY, 1FV, 1SN, 1TS, 1VB, 1KAY, 1HAA, 2BK, 2GR, 2JE, 2PL, 2UE, 3AK, 3HJ, 3JR, 3NB, 3NC, 3NV, 8ABG, 8BB, 8CB, 8CE, 8DA, 8DV, 8EN, 8WY, 8MT, 8XU. Canadian 2AS and 2BF.

6CO, SAN JOSE, CALIF.

(6BQ), (6CM), (6CS), (6DA), (6DH), (6EA), (6EB), (6EB), (6EJ), (6EK), (6EN), (6ER), (6EZ), (6FD), (6FE), (6FU), (6GH), (6GI), (6HH), 6HK, (6HZ), (6JD), (6JI), (6JM), (6OH), 6ZA, (7CC), (7CH), (7CR), (7CU), (7CW), (7DK), (7ZB), (7YS).

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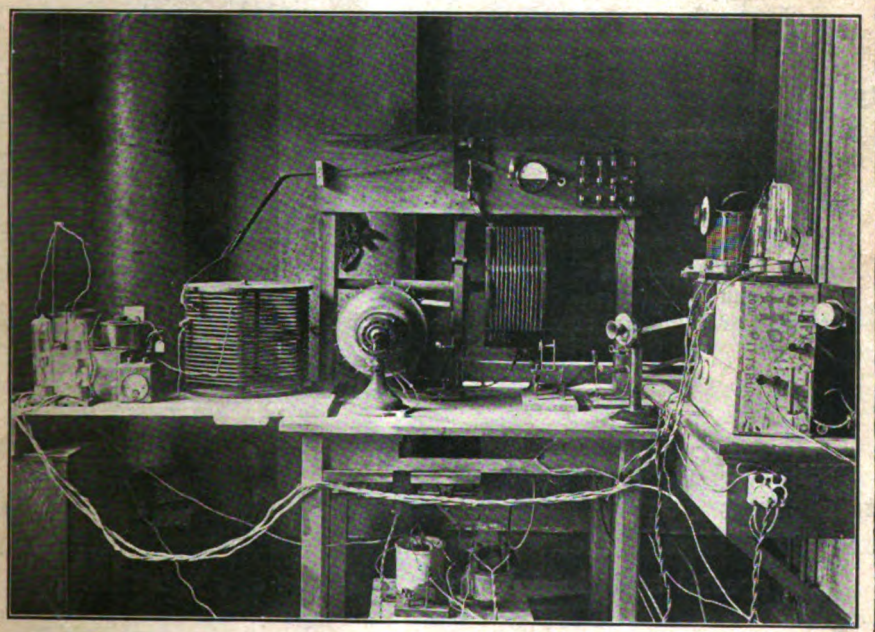
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SEPTEMBER, 1920

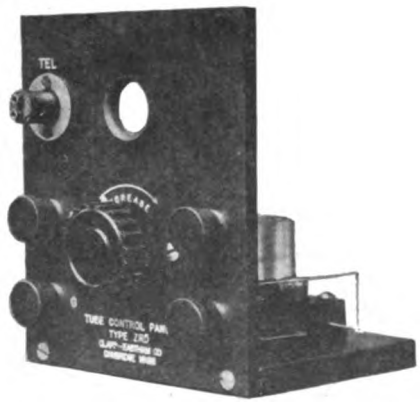
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THE OFFICIAL ORGAN OF THE A.R.R.L.

QST

SEPTEMBER, 1920

VOLUME IV No. 2

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QST
A Magazine Devoted Exclusively to Amateur Radio

A Few Ideas for Amateur C.W.

THE number of C.W. sets is rapidly increasing, and because of the many advantages and the versatility of this system it is inevitable that it will be much in evidence this coming winter. Now is the time to get busy on the construction of the sets—they are worth all the effort they cost.

The main lack at present is tubes, there being at this writing only the Moorhead oscillator on the amateur market, and from this tube it is difficult to get over a few watts. QST is able to assure its readers, however, that in the very near future there positively will be supplied the amateur a complete line of high grade power bulbs, answering every need, and at reasonable prices. Let there be no hesitancy, then, about the tubes—they will be ready when they are needed—small ones, intermediate ones, and large ones. If worst comes to worst, we can send to England for our tubes, where the Edison-Swan Electric Co., Ltd., has quite a line on the open market. Their transmitting bulbs include a 50-watt tube with plate potential 200-1000 volts, filament 1 amp. at 6 volts, price £1.2.6d.; a 100-watt tube, plate 700-2000 volts, filament 3 amperes. at 6 volts, price £3; a 250-watt tube, plate voltages up to 2000, filament 11 volts, 4 amps., price £4.15. These voltages are difficult of attainment with generators, British practice being rather to use a step-up transformer and high-voltage rectifiers as the source of anode potential, and the rectifying tubes also can be bought from the same company. We will not have to send overseas for our tubes, however.

A Description of NSF

The correspondence of A.R.R.L. Headquarters shows an increasing demand for data on the construction of C.W. sets capable of working at least 500 miles. This is proper—there is not much incentive to make the change to tube transmission unless we can have a station capable of good handling of relay business, and although the little 10-watt sets have a phenomenal range, they can not regularly accomplish this distance.

Among the long distance C.W. stations of the present amateur season, 8XK and NSF stand pre-eminent. NSF is the station of the Naval Air Service Radio Laboratory at Anacostia, D. C., and has been doing pioneer work in short-wave C.W. transmission, to facilitate which development it has actively entered the amateur work of the present season. The fading tests from NSF have been sent out on

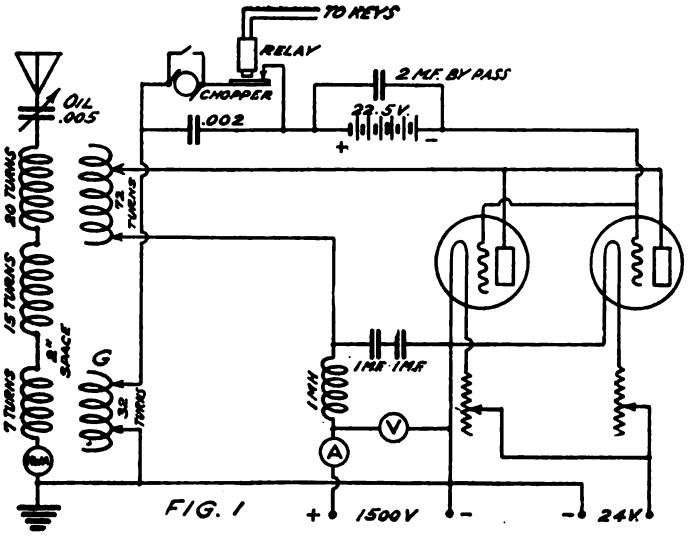


FIG. 1

equipment comprising two 250-watt type P G.E. Pliotrons, putting as much as 9.2 amperes in an Alexanderson multiple-tuned antenna 100 feet high. The circuit employed is the tuned Meissner circuit, shown in Fig. 1; and Fig. 2 will give an idea of the constructional features of the inductances. The constants of this set are such that any wave length up to 500 meters may be used, and although on the multiple-tuned antenna they have got down as low as 120 meters it is probable that better results on the shorter waves would be had by eliminating the unused turns. The aerial inductance consists of 42 turns of cable on a Bakelite form 5" diam. by 13" long. The cable is twisted up from 8 strands of standard Navy Litzendraht, spaced $\frac{1}{8}$" by winding a cord between the turns, and the inductance should be variable in single turns by a flexible lead and clip. Note that 35 turns are wound together, and then a 2" space is left before winding the remaining 7 turns, which are for the grid coupling. The grid winding consists of 32 turns of No. 28 D.S.C. wire on a 4" form, mounted inside the 5" tube under the 7 turns just referred to, and

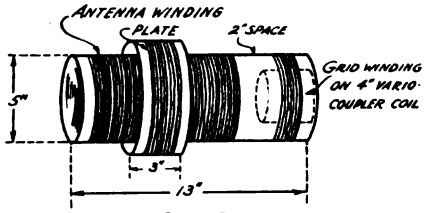


FIG 2

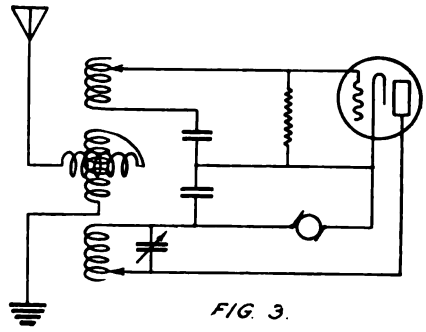
arranged to rotate, vario-coupler style. It is tapped every turn, and 12 turns are used for 250 meters when the two P-tubes in parallel are employed. The plate coil is on a Bakelite tube 6⅝" diam. by 3" long, and slides along the antenna inductance to control the coupling. It was found necessary to carefully tune this plate inductance, and so it is variable a turn at a time. It has 72 turns of No. 28 D.S.C. wire, of which 32 are used for 250 meters with the two P-tubes.

Grid modulation is used at NSF, a grid insulating condenser of .002 mfds. (without resistance leak) being shunted by a motor-driven chopper and relay key. Short-circuiting the chopper makes straight C.W. possible.

The multiple-tuned antenna is a large factor in NSF's success, and while the adaptability of this system to damped transmission is questionable, NSF has demonstrated its high value to 200-meter C.W. operation.

8XK, the station of Mr. Frank Conrad, Pittsburgh, has attracted wide attention through its excellent performance in the summer QSS tests. A full description of it occurs elsewhere in this issue, and in itself will convey many valuable suggestions for the construction of a practical long distance C.W. station.

The Western Electric Co. stations, 2XF and 2XJ, while not operating on 200 meters, are short enough to offer us a few hints The circuit of 2XF is shown in Fig. 3, and in principle is the same as NSF's.


FIG. 3.

The mechanical arrangement (Fig. 4) is quite different, however. The antenna inductance is split, one-half of it being wound in two sections on a cylindrical form and the other half, variometer style, on a revolving member inside the form. The grid and plate inductance are wound on either side of the fixed portion of the antenna inductance, and although mechanically the coupling is fixed, it will automatically vary

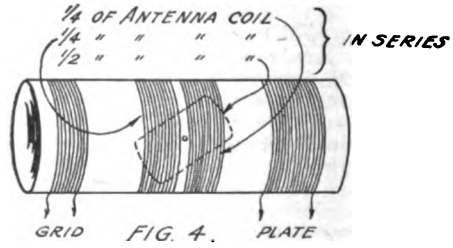


FIG. 4.

more or less correctly in accordance with the variation of antenna circuit wave length.

A Break-In

Many amateurs have noticed that 2XJ and KQO, the S. S. "Ontario", are using a break-in system. The principle of this is shown in Fig. 5. The antenna lead from the transmitter goes to the central point of an inductance, L, forming the receptor primary, there dividing into two branchhes which are adjusted to the same frequency and resistance so that no e.m.f. is induced in the receptor secondary which is coupled to L. For receiving, however, this balanced condition does not obtain, and incoming signal currents induce an e.m.f.

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in the receptor secondary in the regular

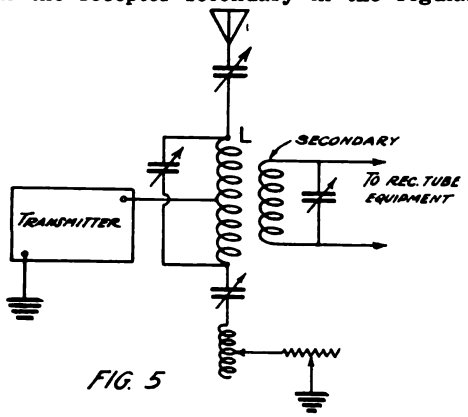


FIG. 5

manner. This is an interesting field for amateur experimentation.

Small Sets

For lower powered sets using such tubes as the Western Electric "E", the General Electric "T", and the Moorhead, we have found no other circuit the equal of the Colpitts circuit described in the May (1920) QST. At the QST Laboratory such a set is giving a very good performance and seems well adapted to the average amateur aerial. There are certain well-defined limits, however, within which the satisfactory action of this circuit seems confined. For 200 meter operation the capacity of the aerial system should not greatly exceed .0005 mfds., and the resistance should be between 10 and 25 ohms. It is difficult to secure a good performance (on 200-250 meters) on capacities of around .001, but this is true of most other circuits too, and brings up an important point in the design of amateur sets. If the aerial capacity is too large it will take energy from the tube so rapidly that the circuit will not oscillate. That is probably the reason why many amateurs have secured their best results from very low-powered sets on a single-wire aerial. It takes power to charge a large antenna. This is a new field for American amateurs, and there is interesting work to be done in determining the forms and dimensions of the aerials for best radiation and best output from the various low powers.

For best output the resistance of the aerial circuit should be as low as possible, but not at the expense of a capacity too large for the set in use. It should be remembered that, as in spark work, antenna current alone is no criterion of range, and that often a relatively low current in a high aerial of low capacity and superior form-factor will excel in actual radiation a higher current in a higher-capacity aerial of poor form-factor.

A circuit such as shown at (a) in Fig. 6 will not function satisfactorily on a large-capacity amateur aerial with a very low powered oscillator, simply because energy for radiation will be extracted from the circuit too rapidly to let it oscillate. The Colpitts circuit is somewhat better for this purpose, but Lauer & Brown, in their textbook "Radio Engineering Principles", cite the circuit of (b), Fig 6, as a satisfactory remedy. Here the plate circuit is tuned, instead of being aperiodic, and so the tube may oscillate independently of the aerial circuit, which is then tuned to the same frequency and coupled at a critical value, the same as in spark procedure.

Grid modulation, as shown in Fig. 3 in

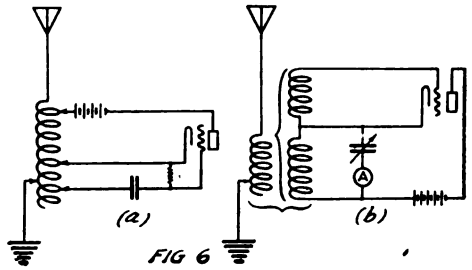


FIG 6

the article on C.W. in the May QST, is being used with splendid articulation in the QST Laboratory. The resistance and biasing battery have been eliminated, the secondary winding of a G.R. modulation transformer having sufficient resistance and impedance for good work with four 5-watt tubes in parallel. However, this method of modulation, while very simple, is not as efficient as the Heising d.c. modulation system.

The Master Oscillator

The master oscillator scheme is an arrangement not now used in amateur apparatus to our knowledge, but having many benefits if one has plenty of tubes. In this method, a typical case of which is illustrated in Fig. 7, the main power tubes are not coupled back so as to oscillate in themselves, but instead function only as power amplifiers, the radio-frequency currents being generated by the master oscillator (which may be any form of oscillating circuit), modulated by voice or for telegraphy in any manner desired, and the modulated radio-frequency potential then impressed upon the input circuit of the amplifiers. It is difficult to modulate large quantities of energy, and the feedback circuits of large oscillators are cumbersome to handle, all of which are avoided here, where the oscillator may be small and insulated for relatively low voltages only and employing, for example, the Eaton or Colpitts oscillator. The precautions in such a set are that the

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voltage variation generated by the oscillator should be just sufficient to vary the grid potential of the power tubes through the length of the straight portion of their very small gap—.02 mfd. was about right in the case of our coil. Now it is well known that the output of a spark coil consists of pulses much greater in one direc-

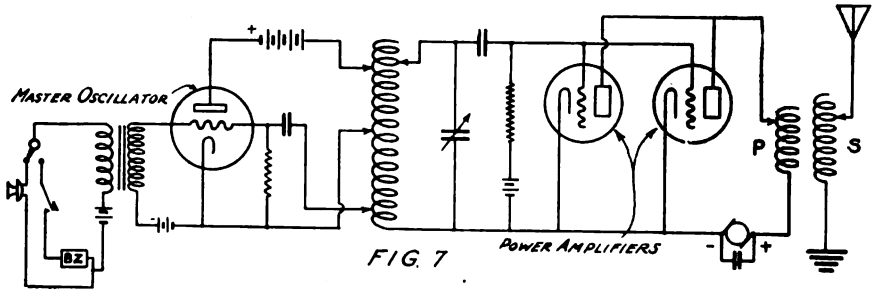


FIG. 7

static characteristic curve; that the grid-biasing and plate potentials of the power tubes be adjusted for operation on the straight portion of the curve; and that the master oscillator, output circuit, and antenna circuit all be adjusted to the same frequency. The tuning inductances in the output circuits may be the usual amateur oscillation transformer, as at P and S in the diagram; or conductive coupling, with a 3-clip helix, may be used. Pioneer work of the Western Electric Co. in this field is described by Messrs. Craft and Colpitts in a paper entitled "Radio Telephony", presented before the A.I.E.E. in February, 1919.

C. W. With Spark Coils

Why do we go to all the trouble of getting a motor-generator set, carefully filtering the output to get a smooth flat-topped wave to feed our tubes, and then chop it again for modulated telegraphy? 8XK solves it by using an independent set for telegraphy, with 700 cycle **alternating** current for the plate supply. The very same thing may be done for small tubes by using an ordinary spark coil to furnish the high potential. Thus our general nuisance seems likely to come into its own after all, and a cheap substitute evolved for expensive motor-generators, where telegraphy is the only aim. In our laboratory our small tube set, with an output of about one ampere with motor-generator supply, puts 0.4 ampere in the aerial when supplied by a 1-inch Mesco coil operated from the storage battery, and we can get any note we want by adjusting the vibrator; and because the modulation is much superior to that obtained with a buzzer in the microphone circuit, the signals from the 0.4 ampere are reported 85 per cent. as loud as from the 1 ampere with buzzer modulation. A good-sized glass condenser should be put across the secondary of the coil, to reduce its voltage to where it will just jump a tion than in the other, due to the greater speed of vibrator "break" than "make", and it is necessary to determine which terminal has a preponderance of positive polarity. This may be done easily with a milliammeter, and the positive connected to the plate and the negative to the filament. It is altogether probable that much better results could be obtained from a specially-designed induction coil with a secondary winding giving nearer the desired voltage and capable of supplying more current (since its secondary resistance could be much lessened), but we have proved to our own satisfaction that an ordinary spark coil may be used, with good results, to furnish the plate energy for a small tube set for I.C.W.

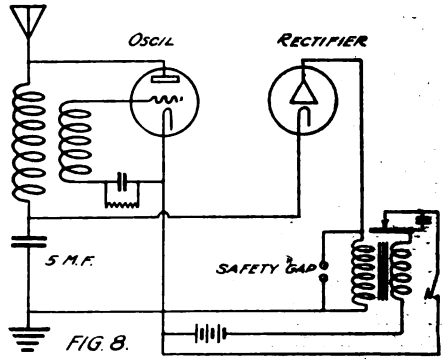


FIG. 8.

This is not new, the British having used it during the war; and the deForest company has just brought out a **telephone** set which gets its plate potential from two **buzzers** operating from the filament battery, apparently the inductive surge from making and breaking the circuit being rectified by two of the tubes, to supply current to the third as an oscillator. A typical British circuit is shown in Fig. 8, where the high potential is obtained from an induction coil, rectified by a single two-ele-

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ment tube, and stored in a large condenser. With the omission of the rectifier, this illustrates very well the idea presented in the preceding paragraph, but is adapted equally well to any form of oscillator circuit, of course.

Filters

In constructing filters it is well to remember that the peak voltage of the a.c. obtained from rectifiers is 1.4 times the the effective voltage which the meter shows, and allowance must be made for this in the selection of smoothing-out condensers. The

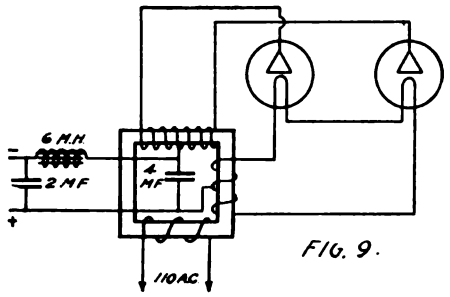


FIG. 9.

Western Electric 1 mfd. paper condenser No. 21-AA is guaranteed for 1000 volts and is very good for this purpose. Any small iron-core chokes of not too high resistance will answer for the filter inductances for a generator, although higher values are necessary for a rectifier filter. Dr. A. W. Hull has shown that for best results in a filter the capacity should be divided, with two-thirds of the total across the source of current, then the inductances (preferably in each leg), and then the other third of the capacity across the output side of the circuit. Connections for a tube rectifier circuit where the filaments are operated from a step-down winding on the same transformer are shown in Fig. 9, credited, we believe, to Mr. E. V. Amy. Note that the d.c. lead from the filaments is taken from the center of the filament winding, the same as the negative lead is tapped from the center of the high voltage winding.

A New Form of Rectifier

In the QST Laboratory we have been doing considerable experimenting with a rectifier using General Electric "Tungar" rectifier bulbs. These tubes are made for low voltage rectification and carry quite a current, the small tube for motorcycle charging handling up to 2 amperes space current. Since these tubes are "arcing" when they operate at even the lowest voltages, the idea occurred to use them for high voltage rectification, it seeming that their current-carrying capacity would be the main limiting factor. Credit for the conception of this idea is due Mr. John L. Reinartz, of 1QP. Work was accordingly started and is very promising, although up to this writing a circuit has not been devised to rectify both halves of the cycle. Because of their low internal resistance the tubes are useless in the ordinary rectifier circuit, a short-circuit occurring through the common filament connection with brilliant ionic displays within the tubes; which, however, they seem to stand all right. The striking feature of this experimenting has been the heavy currents available. We have had no trouble in drawing .5 amperes at 700 volts d.c. (350 watts), and this can be filtered satisfactorily. The price of the small Tungars is but $3.50 each, and we believe that experiments with their use in rectification for C.W. will be extremely profitable. Fig. 10 illustrates the circuit which has been used. The core (not shown) was built up 1¼" high from L-shaped pieces of stovepipe iron cut 5½" x 3¼" and 1¼" wide, making a rectangle 5½" x 4½" outside and 3¼" x 3" inside. The coils were wound on cardboard forms 3" long, 1¼" square inside and 1¾" square outside, on opposite sides of the core. The primary, A, consists of 300 turns of No. 16 D.C.C. magnet wire. The secondary, B, is made up of 2250 turns of No. 26 D.C.C. magnet wire, and gives a 750-volt secondary when rectified. This winding is tapped for 500 volts at the 1500th turn, and for 350 volts at the 1050th turn. The filament winding, C, consists of 10 turns of No. 14 D.C.C. magnet wire, tapped at the 6th, 8th, and 10th turns for voltage control. This winding is wound over the primary, at the last.

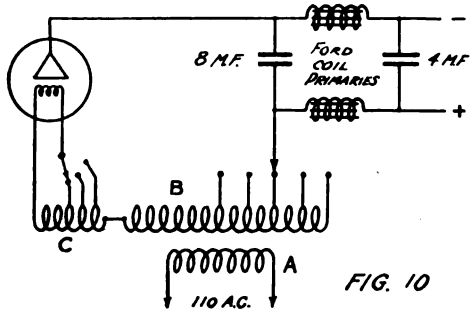


FIG. 10

The Editor will be glad to know what results other amateurs achieve with these tubes. A striking possibility for future designs of rectifier tubes developed in our work when the high voltage was once put on the tube with the filament unlighted. The typical Geissler tube display at once commenced, but during this the filament was heated to incandescence by ionic bombardment so that the tube, after a few seconds, rectified just as well as when the filament had been heated by an external

(Concluded on page 35.)

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Beginning at the End

By "The Old Woman"

Fellows, the State of Tennessee has recognized Woman and admitted her into participation in general activities, so we guess we will too. When first detected, this unsigned story was on the Editorial Desk, and no amount of search would develop the envelope in which it arrived. We do not know who wrote it—we swear we don't. Perhaps she will always remain an unknown contributor, like "The Old Man." At any rate, it's good stuff, and full of humor, as you'll agree. We have no means of addressing her except thru QST, but we want to say, in reply to her last paragraph, that the title "T.O.W." will be reserved for her exclusive use if she will agree to occasionally favor our gang with a story like this. Will you, T.O.W.?—Editor.

AS long as I've known QST I've resisted the temptation to write in and tell what I heard on my crystal detector. I never have done it, have I, Eddy? Well, now my firm resolution is busted, all on account of Miss Ham (f.) writing about the good old days in the July number.

I'm awfully glad there's another of us; it has mortified me to be constantly explaining that I am **not** Mrs. Candler; but when I contemplate that energetic and enthusiastic hameff, I feel as old as Time, world-weary, disillusioned, battle (or bottle) scarred (or scared), cynical and blase. Let her enjoy her halcyon crystal days. Say, deary, wait till you—but no, I mustn't get started on that line.

What I want to know is where's the rest of us promising three-year-olds? We all hopped off together; we all took the plunge, to save our country in its hour of need—we prepared to take our places on ships and shore stations and release the radio operators for ditch-digging and other vital operations. We were egged on by those Lovely League camps, where you put on a dashing uniform, and pranced vigorously up and down and around under the steely eye of an honest-to-God marine drill-sergeant, who seldom said what he thought, though he had the voice for it,—and where you sat in a stylish tent and listened to the strains (nothing ethereal about them, either) of a low-frequency buzzer, and nearly exploded with pride and vainglory when you could take ten words a minute. Why, some of us felt that we could do no less than devote our lives to a career that called us so strongly and for which we were developing such an unsuspected aptitude. We stood ready for the call to foreign service at an instant's notice. But when these gifted ones had departed at the end of the session, in a burst of stars and stripes and Catherine wheels, there were still a lot of us who were interested enough to scratch around for more knowledge. Instruction in theory was scarcer than snow upon the desert's dusty face, as the Government had commandeered all the technical schools, and had an absurd notion that it preferred the services of young men. But there was no prejudice against our getting operators' licenses, and all you needed to know for that was contained in that red question-book! Yes, deary, you're right, it's possible to learn what's in the book, but when your lack of experience costs you twenty points, and you have to make seventy-five out of a possible eighty on what you know, it requires considerable application. And we were proud, too—nothing but first-grade for us! I have left directions in my will that my monument be inscribed:

"If the circuit-breaker trips,
And the fuses blow,
Where will you look for the trouble,
And **why?**"

By-and-by some of the professors took pity on us, and would let us stand around the wall while they tuned up the old rotary, or listen to the oscillations of one VT-1 through the oscillations of another VT-1; and we confidently looked forward to the time when we should have a flock of VT-1's of our own—happy dreams! We hung around Government departments all the rest of the war; they always had plenty of conversation for us, but no encouragement. And at long last the ban on receiving was lifted.

I've been too busy since to follow the careers of my sisters, but I'm sure we all did the same things. I'm sure we all hung a wire out of the window or draped it around a chimney, and grounded the system to anything handy, and hooked up an audion and two stages of amplification, and proceeded to put our expert knowledge into practice. We began to plan what sort of a sending set we would have. Spark-coil? Oh heresy!! Synchronous rotary? Disagreeable. Poulsen arc? Bulky and unreliable, and we didn't like listening to the back-wash, anyway. Alexanderson alternator? Now you're talking; but after all, there's no sweeter voice in the world than that of the power tube. We would be satisfied with the little fellows, that didn't require more than seven hundred

(Concluded on page 14)

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Station Performance During the Bureau of Standards —A.R.R.L. QSS Tests of June and July, 1920

By S. Kruse
Assistant Electrical Engineer, Bureau of Standards

This is a most interesting and informative paper on the performance of our stations in summer, and affords many comparisons between the work done by different stations. Mr. Kruse is in charge of the tabulation and analysis of the data gathered in the recent QSS Tests, so that these figures are authentic. All in all they show a most satisfying record, and the participating stations may know that they have helped to make radio history. We hope for similar comparisons in the future tests, which will give comparisons between conditions in summer, fall, and winter.

Incidentally, in our next number we expect to have another informal paper from Mr. Kruse announcing the results of the tests. Watch for it.—Editor.

THE transmitting and recording stations of the recent fading test system were chosen by the Operating Department of the A.R.R.L. with regard to their geographical location and also their known past performance. All of the calls appearing in the system are those of well known stations. In addition to the fading data obtained, which will be discussed in a later paper, there has been obtained considerable information as to the performance of this group of stations, admittedly of our best.

A caution is in order; much of the reception here discussed is not commercial communication, nor even relay communication. Many very good curves were obtained through atmospherics which made it all but impossible to distinguish the letters which were being sent. Under such conditions the exchange of messages would have been impossible; in fact it is very likely that if the test had not been sent at a fairly exact time the station could not have been identified.

It is not well, then, to conclude that the same group of stations could have handled traffic through the very adverse weather in which the tests were run.

They did, however, obtain fading test curves consistently during a season of the year that has been regarded as making all short-wave work impossible, and did this over an average distance of 400 miles at 250 meters wave length with the existing transmitters and receivers. There was also a fairly large amount of conversation between the sending stations in the intervals between tests.

THE RECORDERS

Of the 51 recorders an average of 26 were on duty per test night, and on no occasion did less than 20 "stand watch." The figure 51 is somewhat misleading, as several pairs of recorders alternated, while others were not able to participate in the entire 7 week test.

The performance of the individual recorders is best seen in Table I. In reading this table one must remember that the western and southern stations were not only receiving at longer ranges (as shown in the Table) but were doing this through weather of a severity totally unknown on the Atlantic coast. It is well to emphasize this.

During the winter the Mississippi Valley presents ideal transmission conditions, great ranges being covered by low-powered stations—not occasionally, late at night, but consistently, day after day from September to April. Five hundred mile communication between ½ KW. sets is regarded as a matter of course and attracts little attention. That is about the distance from Boston to Richmond.

In the summer, conditions are violently different. Ranges decrease tremendously; often it is not possible for good one kilowatt stations 70 miles apart to communicate in daylight. And with nightfall comes QRN of a kind unknown on this coast.

It is impossible to keep a crystal in adjustment during the particularly bad evenings, while the uproar in the receivers is such that receiving becomes impossible unless signals are very loud.

I have been much surprised to find that at both Washington and New York, local lighting generally fails to produce disturbances of a violence equal to that of these regular summer evenings statics which are quite apart from storms.

Turning to Table I again, it is readily possible to see these adverse conditions appearing in the reduced number of schedules copied by the 9th district and western 8th district stations. The same effect is more prominent in the case of the two 9th district senders.

It is noteworthy that 50 of the 51 recorders used tuners employing the familiar "Paragon" Circuit.

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THE SENDERS

Table I needs but little comment. It is well to reiterate that 9ZN at Chicago and 9LC at St. Louis were working through a short range season, the tremendous Mississippi valley atmospherics, and a heavy handicap of thinly spaced recorders. That both were repeatedly copied at 9ZC, Baudette, Minnesota; WWV, Washington, D.C., and 5DA, Wind Rock, Tennessee, speaks well for these two stations. 9ZN was repeatedly copied in New England. All this was exceptional, however, and few records were obtained west of Pittsburgh.

Early in July 8ER at St. Mary's, Ohio, was added in a partly successful attempt to improve this condition.

TABLE I—PERFORMANCE OF RECORDING STATIONS

		Average Distance to Senders	Number Evenings on Watch	Total Tests Heard	Remarks
1AE	Young, Dorchester, Mass.	417	9	27	
1AK	Bowen, Fall River, Mass.	520	11	47	Alternate with 1HAA
1AW	Maxim-Warner, Hartford, Conn.	514	21	62	
1BG	Shorey, Melrose, Mass.		9	23	Stands Night Watch at NAD
1CK	Robinson, Braintree, Mass.	530	18	58	
1CM	McLane, Laconia, N. H.	554	15	54	
1DQ	Briggs, Brookline, Mass.	530	7	8	
1EK	Houston-Stoughton, Portland, Me.	615	9	23	Both left City June 22nd
1HAA	Vermilya, Marion, Mass.	548	5	6	Alternate with 1AK
1NAQ	Randall, Hartford, Conn.	440	4	8	
1SN	Dodge, Beverly, Mass.	566	1	1	
1TS	Mix, Bristol, Conn.	440	20	72	
1YB	Corbin, Hanover, N. H.		2	5	
1FB	———— Prout's Neck, Maine		1	2	To take over work 1EK July 8
NSF	Naval Air Station, Anacostia, D. C.	865	16	49	
2BF	Lorimer, Montreal, Quebec	567	12	39	Working evenings
2BK	Trube, Yonkers, N. Y.	396	8	8	Replaced 2JE July 1st
2FG	Myers, Albany, N. Y.	310	2	3	
2JE	Eddy, N. Rochelle, N. Y.	450	11	41	
2JU	Goette, Woodhaven, L. I.	450	17	50	Receiver out one night
2OE	Raynor, Freeport, N. Y.	410	17	10	
2TT	Rechert, New York, N. Y.	410	4	14	
2YM	Y.M.C.A., New York, N. Y.	410	16	34	No oper. 3 Nights
2ZM	Spangenberg, Clifton, N. J.	380	16	22	
WWV	Bureau Standards, Washington, D. C.	370	5	15	Saturdays only
3UU	Blair, Richard, Va.		21	0	Nil altho 2 stations on all tests
3BZ	Gravely, Danville, Va.	430	11	46	Local spark Coil QRM 6 Tests
3EN	White, Norfolk, Va.	450	20	51	
3JR	Snow, Washington, D. C.	370	12	34	
3NB	Frye, Vineland,, N. J.	380	21	69	
3UA	Duvall, Baltimore, Md.	370	15	34	
3ZA	Service, Bala, Pa.	390	15	46	
3ZS	Stewart, St. David's, Pa.	390	3	13	At Avalon N. Y. till July 1st
3SU	Chism, Washington, D. C.	370	6	26	Started July 8th
4AT	Gulledge, Ft. Pierce, Fla.	990	1	2	
5DA	Hutcheson, Wind Rock, Tenn.	490	12	38	Gone 8 tests on business trip
8AAN	Benzee, Buffalo, N. Y.	370	15	47	
8ABI	Daniels, Dayton, O.	350	6	17	Sick—Compelled to Stop
8BQ	Walleze, Milton, Pa.	340	19	88	
8CE	Ehrhardt, Dunmore, Pa.	370	5	12	
8DA	Manning, Salem, O.	330	4	14	
8ER	Candler, St. Marys, O.	330	20	47	
8IB	Higgy, Columbus, O.	330	3	12	Station Closed after June 8
8WY	Lord, Cambridge Springs, Pa.	320	20	128	
8XK	Conrad, Pittsburgh	350	21	55	
8XU	Homan, Ithaca, N. Y.	370	9	30	Station Closed after June 17
8ZW	Stroebel, Wheeling, W. Va.	310	11	37	
9DT	Patch, Dubuque, Iowa	560	18	0	Notice received 2 days late
9ET	Thompson, Galesburg, Ills.	540		0	Replaced by 9NQ
9JA	Stover, Marengo, Ia.		1	2	Dropped out at start tests
9LC	Woods, St. Louis, Mo.	440	4	8	
9NQ	Burke, Galesburg, Ills.	540	11	21	Replaced 9ET
9ZC	Gjelhaug, Baudette, Minn.	930	15	21	
9ZJ	Hamilton, Indianapolis, Ind.		8	27	
9ZL	Burhop, Manitowoc, Wis.	510	12	19	Station Moved—out 8 tests
9ZN	Mathews, Chicago, Ills.	500	13	17	
9ZV	Crowdus, St. Louis, Mo.			0	Dropped out at start
	Perkins, Kansas City, Mo.			0	Dropped out at start
	Radio Club, St. Paul, Minn.			0	Dropped out at start

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The performance of the senders was admirable in every respect. Very few schedules were missed after June 1st, at which time only 1AW at Hartford, Conn., and 2JU at Woodhaven, L. I., had been notified. NSF at Anacostia, D. C., was compelled to miss two schedules because of power failure outside the station. The schedule of June 3rd was sent by 3ZW at Washington, D. C., which station on this occasion made a most remarkable record, 25 out of 37 operators on watch copying the complete test including the statement "3ZW sub NSF." One station breakdown occurred, at 2JU, luckily on the last test day. One schedule was missed by 9ZN. 9LC missed a number of schedules thru sickness of Mr. Woods. Before the close of the tests 9LC was dismantled and moved.

The Senders were open to one minor criticism—they did not at any time, clear to the end of the seventh week, observe the correct starting time with any exactness. Even the large time interval between schedules did not prevent overlaps on two occasions. Probably local, rather than Arlington, time was used.

CO-OPERATION BY OTHER STATIONS

At Richmond, Va., co-operative reception was attempted but no signals were heard although several operators stood watch faithfully throughout the tests.

Co-operation of another type appeared in recording. In every case where a recorder dropped out, a slight effort sufficed to find a substitute.

A surprisingly large number of operators who were purely spectators in these preliminary tests, stood by patiently during every test, and very often helped to broadcast QRX requests. In this neighborhood 3NB's booming spark was especially helpful.

There was interference, however, mostly from shore stations (WSO, NAH and NAM), spark coils, and radiophones. The shore station interference was especially severe from NAM, seemingly because of a very broad wave.

Spark coil interference is always present, usually because of ignorance.

The radiophones cannot be so easily excused. The vicious practice of holding three-hour local conversations during the latter part of the evening cannot be too strongly condemned. It caused the loss of many records in these tests.

A few transformer-powered spark stations were guilty of deliberate interference with the tests, but all were disposed of.

TABLE II—PERFORMANCE OF TRANSMITTING STATIONS

	Number of tests scheduled	Number of tests sent	Total tests listened for; i.e. scheduled tests times observers on duty	Total tests heard	Percent. of scheduled tests listened for which were heard	Average distance to recorders	Recorders within 250 miles	Equipment
1AW	21	21	555	362	65	343	22	60 cycle non-synchronous rotary gap
2JU	21	20	554	318	57	330	24	60 cycle non-synchronous rotary gap
NSF	21	17	501	305	61	330	21	Tube set, D. C. plate—grid chopper Multiple-tuned antenna
3ZW	1	1	37	25	71	330	21	60 cycle non-synchronous rotary gap
8XK	21	20	538	381	68	350	10	Tube set, 700 cycle plate—no chopper Antenna and counterpoise
9ZN	21	19	538	223	41	580	6	500 cycle quenched gap
9LC	21		538	14	3	690	1	60 cycle non-synchronous rotary gap
8ER	6	6	154	83	54	450	7	60 cycle non-synchronous rotary gap
Totals			3415	1706	50			Note—Total number of recorders, 51

CONCLUSIONS

Request for statement as to the relative merit of the spark and tube sets have been frequent. A very cursory examination of Table II will show that the five eastern stations (counting 3ZW) performed about alike, neither tube nor spark having a marked advantage.

The scheme of operation has proved practical and has shown convincingly the quality of operators and apparatus at the better A.R.R.L. stations.

The placement of stations was not ideal, too few recorders having been placed west of Pittsburgh, Pa. We were misled by the very great winter ranges in this region.

In the three further series of tests which will be run in October, January and April,

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the general plans of procedure will be retained but the station network will be rearranged.

The success of the recent tests was not only a proof of station quality; it was also a demonstration of the spirit of wholehearted co-operation that the A.R.R.L. represents.

(A.R.R.L. representatives have held another conference with representatives of the Bureau of Standards and other interested bodies, at which the results of the above mentioned tests were reviewed and plans laid for future work. It is very desirable that additional data be collected, not only along special lines which past tests have shown desirable, but to get comparative data on conditions at different times of the year. Accordingly, additional tests for October, January, and April are now being planned. The new tests will be on but two nights per week instead of three, and over a period of but one month at a time, altho they will follow the former plan as regards time and wave length. It is intended also to make additional noonday and sunset runs, probably one in each of the three months. In this conference consideration was given the many suggestions for improvement which have been made by various participants, particularly features bearing on the length of time of the tests and a more accurate time axis for the curves. It was decided that in the future tests, each letter of the alphabet will be transmitted continuously at any desired speed for a total time of five seconds, passing on to the next letter without interruption. This will prevent distortion of the time element due to the smaller length of time required to send any definite number of certain short letters such as E, I, etc. A continuous curve or series of dots is contemplated to care for changes in audibility occuring within the five-second period. Transmission will be thru the alphabet in the usual manner, then backwards to A in the reverse direction, providing a longer period of observation. The number of transmitters has not been definitely determined upon—whether a line-up much as in the first tests will be followed, with a better distribution of recorders, or whether it would be better to reduce the transmitters to not over three in number, and greatly increase the number of recorders so as to follow what seems a very desirable scheme, the securing of a larger quantity of data on a smaller number of transmissions. At any rate the recorders will be specially chosen for their reliability.

The A.R.R.L. QSS Tests will have concluded when this appears in print. It is too early to forecast the results, but they seem none to favorable as viewed at this writing. In the southern states QRN has been so terrific as to make them practically a flat failure. They have been run at the very worst time of the year for every locality, and coupled to this is the fact that August is the great vacation month and hundreds of stations have been idle which would otherwise be on the job. All these features are combining to result in a dearth of reports, but it is still expected that information of decided value will be obtained.—Editor.)

BEGINNING AT THE END

(Concluded from page 10)

volts plate potential, and as we would have to tune the set sharply on amateur wavelengths, no one but amateurs could hear us, and none of the amateurs could, so we would never interfere with anybody. I've been a little backward in getting my set started, because I've been expecting to hear from some of the other girls about what they've done in the matter. I'm a bit rusty on the code, too; those operators at XDA and Darien think they're so smart zizzing along at seventeen words a minute, when all the biggest stations are careful not to exceed thirteen.

Well, where are we all? I sort of expected to find a corner for us in QST, with a prize for the best use of a bent hairpin, or how to keep your No. 42 copper wire combed and brushed and ready for use. There were fifty of us when I began, and there must be hundreds since. And now, Eddy, don't cut out those highbrow articles on our account! We may not understand them, but you know, we get interested in Micro Mike, and the ubiquitous Constance, and Elsie with the square foot—I mean root—and even if we don't know the difference between r.m.s. and r.p.m. we like to roll them under our tongues.

And say, if nobody else has it, can I grab this title? "The Old Woman"



9AJ's Idea of T.O.M.

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Construction of a Two-Step Amplifier

By McMurdo Silver

SINCE the signing of the armistice and the lifting of the ban upon amateur radio activity, much has been written upon multi-stage vacuum tube amplifiers for audio and radio frequencies, but mostly in a general way, and very few articles have appeared in the current radio publications on the construction of a simple and yet efficient amplifier suitable for all around amateur use.

As stated in the May QST, audio frequency amplification is all wrong from the start, but unfortunately it is the only means of increasing signal strength at the disposal of the majority of amateurs. Radio frequency amplification, if transformer-coupled, is limited to a certain band of wave lengths, depending upon the constants of the transformers used. Major Armstrong explains why resistance coupling is unsuitable for very high frequencies, and puts forth an excellent solution of the problem in the Armstrong Amplifier, but most of us look at two or maybe three tubes with awe and veneration, let alone the number necessary to build such an amplifier.

For the above reasons it was decided to use Honeycomb Coils and a two step transformer-coupled audio frequency amplifier, as it was believed that this combination would entail the use of a minimum amount of apparatus and adjustments for the results obtained, and also because this type of amplifier will function efficiently on either long or short waves.

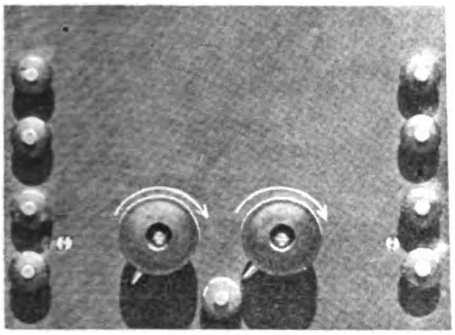


Fig. 1.

In the following paragraphs will be given the description of an amplifier constructed with an eye to extreme simplicity along the ideas outlined above.

Fig. 1 is a front view of the completed instrument. The panel is 7½" by 5½" high, of hard rubber and supports the entire unit, with the filament rheostat knobs and all necessary binding posts conveniently located on the front. Fig. 2 gives a rear view of the same instrument, and shows the method of mounting the tube sockets, rheostats, and amplifying transformers.

The tube socket, in this case a double base, is clamped between two pieces of sponge rubber at each end, thus providing a somewhat shock-proof mounting. It will be noticed that the tubes are held horizontally, and while it might be better to mount them vertically to prevent sagging of the elements, no trouble has been experienced from this source. The rheostats are attached to the panel by screws through holes provided in them for that purpose, and are of the Paragon type, now widely advertised. The amplifying transformers are held by small pieces of brass strip, bent into the form of a clamp, and fastened to the panel by a single machine screw. They are so placed at the side of each rheostat that there is about 4½" spacing between them, and while the windings are in the same plane, they run in opposite directions. Their D. C. resistance, in the two measured, was 1000 ohms for the primary and 6000 for the secondary, approximately, and they were selected after a trial of several makes, for their high transformation ratio, and for the fact that they seemed best suited to the tubes used. It should be possible to procure them from the nearest radio supply company, or they can be gotten direct from the makers*, unmounted.

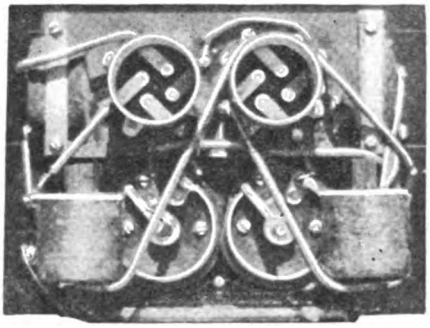


Fig. 2.

It might be well to point out that transformers should be selected whose primary impedance, at the desired frequency, will conform with the output impedance of the tubes to be used. In the case of the Marconi VT, this is 60,000 ohms; of the VT-1, 20,000; the VT-11, 40,000; and for the VT-21, 60,000; approximately.

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All wiring was done with No. 16 bare copper wire, covered with cambric tubing, with all connections well soldered to binding posts pinned to the panel, to prevent turning even should the fastening nuts come loose. All wires should be run as much as possible at right angles.

No provision has been made for adjusting the number of steps used, as this would only complicate the wiring and increase the possibility, and not a far distant one at that, of howling. Increasing or decreasing the filament current of either of the tubes will provide an excellent control of the amplification, although care must be taken not to burn out the filament.

Nine binding posts were used, for the input, output, filament and plate batteries. The extra post is for the insertion of a negative grid potential, which, while an amplifying tube should be operated upon the straight portion of its grid voltage-plate current curve, should never be changed to positive in order to operate the tube on this part of its curve. This potential, seldom over two volts with most tubes, should be closely adjustable so that a point of maximum amplification, at which extraneous noises and distortion will be reduced to a minimum, can easily be found. The other end of this grid battery should be connected to one of the filament leads—whichever proves best in actual use.

Another method of obtaining the desired potential is by taking a drop upon the filament rheostats, although this is not recommended as any change in I_f creates a change in E_g. The voltage drop is $E = RI$, in which the current flowing in the filament circuit is represented by I, the resistance of the drop by R, and the resulting grid potential by E. It is not always necessary to use a grid battery, and in this case the extra binding post can be connected directly to the filament.

Fig. 3 gives a circuit diagram which will operate with the same filament and plate batteries used for the detector, providing the negative terminal of the plate battery is connected to one side of the filament battery. Fig. 3 illustrates the method of holding the grid negative without the use of an extra battery, and shows only the amplifying transformer secondary, filament, filament rheostat, filament battery and grid If the resistance of "A" is 2.0 ohms, and the filament current is 0.75 amperes, then the drop is 1.50 volts, or the resistance of "A" times the filament current.

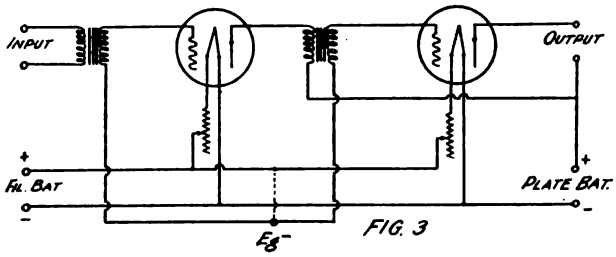


FIG. 3

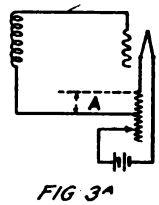


FIG 3A

The complete unit will fit into a cabinet with inside dimensions of 7½" by 5½" by 5" deep, including the tubes and two of the smaller type 22.5 volt plate batteries. The total cost, except the labor, was slightly over $19.00, figured at list prices, compared to the $50.00 or $75.00 asked for the amplifiers of this type now on the market.

Name on request.—Editor.

Standardizing Cabinets and Parts

RADIO operators who build their own apparatus will be interested in the Amrad announcement, elsewhere in this issue, of a line of finished and standardized cabinets. The line includes a 10" x 10" x 10" cabinet with removable front, and can be used either as a large single unit, with 10" x 10" panel which is supplied separately, or as a carrying case to contain two or more of the smaller units. These latter are 6¼" deep and in two sizes: 5" x 5", and 10" x 5", complete with flush-mounted Bakelite panels.

Of equal interest is the new Amrad Knob and Dial. The latter is of a non-magnetic alloy, which, in addition to its durability, acts as a shield from the capacity effects of the hand when adjusting the apparatus. The design is such that the dial is always insulated from actual electrical contact with any part of the circuits. It will be noted that the Amrad Knob and Dial is the first indicating device of its kind designed to be turned in a clockwise direction for increase of current, capacity or coupling. This will be especially appreciated by those accustomed

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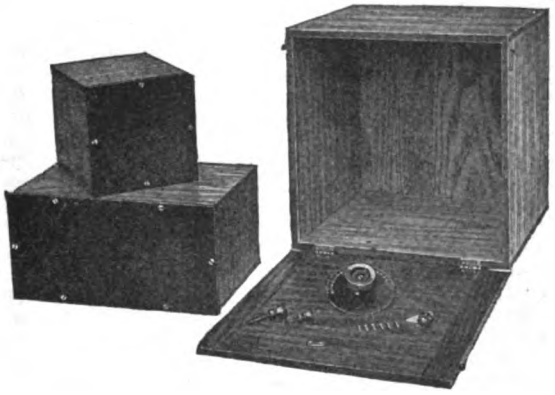
to the confusion which results where this detail is not standardized.



The Amrad Knob, which can be obtained separately, adapts itself to all sorts of construction with equal facility. A long, round head 8/32 screw may be secured to the knob through the threaded upper portion if desired. As in the case of the dial, the shank of the knob is drilled to pass standard ¼" shaft, a set screw threaded through the shank securing the connection.

The Amrad Switch Arm and Knob is designed for use where space is a factor. Contact points are also listed The high quality binding posts used on all Amrad equipment will be available everywhere soon. These have non-removable tops and like all other metal parts are furnished in dull nickel.

All the parts, panels and cabinets are identical to the stock that will be employed in the manufacture of standard Amrad Receiving Units which are now in the final stages of development. This means that an operator desiring to make one piece of apparatus and purchase another may, by using these materials, build an article that will very closely resemble the completed Amrad Unit which he may wish to add to his set of a later date. By means of simple connectors supplied at nominal cost any number of the 10" x 5" and 5" x 5" cabinets may be fastened rigidly together as a single unit. Operators may begin with two or three simple units and add others as they wish, at all times preserving the neatness and uniform appearance of the entire set without the necessity of any special construction work.



The First Epistle from The Young Squirt to The Old Man

By QRU

BY the shades of Mike Faraday and Julius-Caesar, Friend Ham, lend me your shell-like ear and let me gently inquire who in tarnashun and thunderashun is the wild galoot from the west who is always hollering "Rotten"? By heck, this bewhiskered old son-of-a-gun has got my horned animal, or to be brief, explicit, and to the point, my goat. For the last five hectic and sufferin' years all I've heard him yell is "Rotten". Tell him to go take a walk, take a bath or a shave. Perhaps he can take a drink, (if he can get it). Go and see that pretty little show called, "Open Your Eyes"; that might help some.

I want to remark with all due sang froid (which is no relation to aperiodic oscillations) that everything about us hams ain't rotten. Just to prove my brave and bold assertion, I'll hereby request in a gentle, subdued—that is, in not too stentorian tone of voice with a chortle of discontent—that this bewhiskered gazabo take an optical slant at the antenna depicted on the July QST's cover and then peep inside at the works and the jeweled bearings of the station. Does that look rotten to you, you howling old Bullbum? Go hide your aged cranium, old Pessimistic Humbug Arratus.

Listen in on your own part of the world, Skeezicks; hear Mrs. 8NH (as we'll always know her). Is her spark rotten, is her fist rotten, is the intensity of her signal rotten when we get her down here in New Eng-

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land like seventeen regiments of Scotch Highlanders full of Gordon Rye? Answer up, you old geezer, before we dance on your old oaken coffin.

And tell me this, Methusalum, what's rotten about stations like 1HAA and 1AK? You oughter take a trip to 1AK, seat yourself in his leather upholstered operating chair, lean back in bliss and comfort and be lulled to rest by the helluvanote of YN, the whistle of POZ, or the falsetto of LCM. Then throw in his Paragon and hear the dope from Willie Smith out in Missouri who is vainly trying to date up his girl using as a means of dating his little half-inch spark coil Who said "Rotten"? Everything in the game ain't rotten, as I remarked to a fellow fan when Babe Ruth knocked his twenty-seventh homer. Of course you and I are rotten; that's why our fellerhams fall for this bunk. It's so darned rotten that they laugh out of sympathy for the authors. No matter about that, I'm all right and the world's askew and you (OM) are a loud shouting airdale, mud-slinging hashound. Release the man, he is badly lacerated!

I suspect that you have a dark, dismal and damp cellar at your domicile where you are wont to congregate down by your waterpipe and where your ground begins. On a broad and massive shelf overhead, I can now, in my mind's eye, see you reaching up and detaching a large brown bottle with a bulging belly from said shelf. This bottle, as I see it, is inscribed, "Wood Alcohol, for Adults Only". You put this horrid exhibit to your lips and take a long drag therefrom. Then you gasp for breath. Back with your shoulders, out with your chest. You feel 75 years younger. You feel fine; you're drunk y' darnphule. This is the time, I suspect, that you write those rotten, tainted and corrupted stories. I believe, you old scarecrow, you're too darned mean to speak a good cheerful word to us young hams: afraid that we'll ask you to lend us your darned old squeaking Betsy or your poor abused cat. Personally I don't believe that you've got a Betsy; I think that it's a tin Lizzie.

Did you read that stuff in our July issue written by Miss Grammerhausen—femule ham? What was rotten about that? Guess she is a regular guy. Admit it, you crab-walking, slant eyed son of Macaroni.

I sure had to laugh when I read of an old has-been like you trying out impulse excitation. Guess you know more about output indigestion!

Let's not drop the subject—while we're at it let's flay this knocking old mugwump alive. Now, I myself can sit in on my superdreadnaught set and get stuff that ain't corrupt. By suitably adjusting the deterioration of my filament due to electrionic emission, (hoping that the Ham (F) gets that phrase OK and considers that my think-tank is not out of phase) and as the tiny atomic and infinitesimal electrons seek the path of Prohibition, that is to say the straight and narrow, I proceed to adjust my circuits to resonance, not neglecting the tertiary. Here am I up in New England and twitter—twitter comes NSD. I use NSD as I was wont to use a test buzzer in the Palmy Days. I hear NAM say to him, "O, NSD, O NSD, why don't you set old Ireland free?" Then I know that my antenna is still up and that there's considerable push to my main spring. So I bend my well moulded head to my work and my youthful countenance (whatever that is) lights up with a beatific and a 100KW. smile. Hope that all hands will excuse my poetic language. I gotta compete with old Jingle-Jazz. Now my gear is adjusted, so stand from under. I cut her down to 200 meters. In through the window comes 1AW—also that bird Runyon—a guy out in Oak Park, Illinois, whispers in my ear, and Mrs. 8NH flirts with me—a married man. I glow with pride because this ain't so bad for home made stuff. I try to spit on my female pussy in my zeal, for you see I'm not to be outdone by old Tom Long-whiskers. I miss pussy and spit in the baby's ear. Do you call that rotten, Old Drybones? I'll say it's gud work—it denotes perfect resonance and unerring aim.

Get some Omega Oil and douse your withered shinbones, Old Timer; then maybe you can get down on your creaking knees and thank the Lord that you're alive and that you can still hear the lusty roar of the Ham around the corner.

On the level, I'll bet that you were one of those gazaboes who, in the year 1910 or thereabouts, made the ether squirm to the tune of your decrement. I can see you now, smoking your old black pipe, a green shade pulled over your watery eyes—gazing into vacancy and pounding the devil out of one of Turnsback's keys. On the tail end of the key you have a tick tacking spark coil operated through an App's hammer. You still have the hammer, I'm sure. Down goes the key and up goes some poor old commercial station—another good old electrolytic gone wrong. You pound on in blissful ignorance and the London Constabulary arrests a man for stealing a loaf of bread.

I sure hope, though, that I can see you down in New York some time. We'll go Hellpoppin' together. We must take in a good show, guzzle a little moonshine together, accompanied by the Edison Military Band and the office force of QST.

Come out of your hop, Old Beezlebub, or I'll put Sheer-luck Holmes on your trail, and he'll have Watson with him.

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Our Less Experienced Brothers

By Hiram Percy Maxim

Periodically we of the A.R.R.L. are benefited by a heart-to-heart talk by our President on some of our vital affairs, and never fail to gain thereby. The tendency of the more advanced amateurs to set themselves up as a class apart from the beginners constitutes a danger to our great organization of amateurs, and this is the topic of Mr. Maxim's article—this and how to overcome it. The careful consideration of all A.R.R.L. members is asked for this subject.—Editor.

ONE of the things which everybody must have observed for some time is the growing tendency for the experienced amateur to detach himself from the inexperienced amateur. It is not a good sign. While it may be asking considerable of the experienced amateur to limit himself to the abilities of the beginner, nevertheless, it is necessary for the common good that the new fellow should be offered not only the fraternal hand, but also the helping hand. If this had not been the practice in the early years of amateur radio, many of us who are now experienced might not have had the chance to occupy our present position. I might have been one of these. I suffered the handicap of having to start learning nearly everything, from the code up, after having passed well beyond forty years of age, and since it is quite an undertaking for an old dog to learn new tricks, it was principally because of the kindly help of those who were more experienced than I that I was enabled to take my place finally among the experienced. In those early days almost everybody was a beginner, and in consequence it was not considered a great favor to condescend to work and associate with a beginner.

Amateur radio of ten years ago was not so complicated nor so difficult to master from a standing start as it is today. Then, it was nearly a case of an aerial, a convenient water pipe, a loose coupler, a crystal detector, and a pair of telephones for receiving, while a spark coil, a fixed gap, and a photographic plate condenser made as good a transmitting set as any one had. It was simple for any one at all versed in electrical matters to quickly possess a fairly representative radio station. Amateurs rarely worked over a greater distance than five miles and signals from a few city blocks away were considered worth listening to.

It is very different now. Receiving apparatus has become a complex of very involved oscillating circuits, and not only is its cost many times that of its early equivalent, but in addition it is all but impossible for a beginner to master. When the latter is confronted by a modern amateur station such as the average experienced amateur possesses, he either abandons his hope of entering amateur radio, or, if he is unusually persistent, he places the experienced amateur in a class by himself and makes up his mind to join hands with what he calls "the small fry". Here begins the cleavage. Two classes of amateurs having little to do with each other develop. The experienced amateur naturally joins hands with his experienced fellows and the less experienced places himself with the other less experienced. In some cities a break in cordial feeling follows and different organizations and clubs are formed. A sort of aristocracy is built up, and this is not a healthy condition. It breeeds class distinction which is not American. Conflict of one form or another always follows and in this conflict both sides suffer.

The problem is how best to combat this tendency. In my own case, I try to make frequent contact with the beginner. Frequently he is difficult to cultivate. Some times he appears to misinterpret my motive, apparently thinking I am either collecting legal evidence against him, or laying plans to sell him something. It takes a long time to convince this type that I am honestly trying to help and fraternize. Many other experienced amateurs must have met this same condition.

It is the least of the trouble, however, because in time any desirable person comes to see the light and is willing to shake hands. Our chief trouble is the getting of the experienced operators as a class to act uniformly in a manner that will attract the beginner rather than repel him. It is distinctly to the interest of the experienced amateur to strive in this direction since it is the general success of amateur communication as a whole that makes it interesting to operate a fine station. If there were no worth-while traffic, for example, to handle, interest would not last very long. If instead of some form of traffic, such as our present A.R.R.L. relay traffic, everything were general conversation, indulged in by everybody generally, things would quickly become intolerable. Interference would become so great that nothing worth while could be done. General conversation by radio, as we all know, usually consumes a lot of time. We all recall instances of long waits while two stations finished some conversation, most of which was of small

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point. On the other hand, message traffic is not only usually short, but it is also frequently of value. In any event, it possesses a charm and a pull which is never ending.

The beginner, no matter how crude his equipment, is invariably glad to get into this traffic game. It is even more inspiring to him to actually handle a message than it is to us experienced fellows. Once the beginner has a taste of actual traffic handling, his fate is sealed and he somehow soon finds the money to buy more and better equipment, and the time to master its theory. One cannot but feel, therefore, that there ought to be a closer bond between the experienced and the inexperienced amateur if the former would make it a practice to turn over traffic wherever possible to the latter. Judgment of course has to be used, but there are many cases where the smaller stations could have a chance.

There is a reason for this necessity for building up and maintaining cordial relations between the older amateurs and the beginners. This reason lies at tne very base of amateur radio. It comes about because of the basic fact that there is only one air and we must all use it in common. We cannot go it alone from the very nature of things. It is more true of our radio than of any other activity. This makes it positively necessary that the community spirit be encouraged and prevail. The experienced amateur cannot work if the inexperienced amateur is not willing to co-operate, just as the inexperienced cannot function without the co-operation of the experienced. Even the experienced cannot function without the co-operation of their own kind, and the beginner would find it very uninteresting of he could not have the co-operation of his fellow beginners. Being so completely dependent one upon the other, the desirability of so shaping our actions that we shall not produce class distinction and conflict must be apparent to all of us.

One method of cultivating the fraternal spirit among all classes which has proved very successful is for the experienced amateur to make it a point to invite in to his station the beginner. The latter are invariably anxious to see the inside of a good station. In most cases it is their first view of a real wireless station. They acquire information at an extraordinary rate of speed and they form standards of equipment and of operation which exert powerful influences in moving them out of the beginner class. If they can operate even passably well, they should be given the key and encouraged to actually work. If by any chance they can hear a distant station and call and receive an answer and pass a few signals, they are inoculated permanently, and tremendous good is done for all concerned. One single bit of QRM from another beginner at such a time brings down more effective criticism than volumes of printed matter could possibly accomplish.

The value of the radio club enters at this point. Nothing is so conducive to advancement of the beginner than attending meetings of a group of his fellows. But these clubs are not as effective as they should be unless the experienced amateur also joins them and attends meetings at least once in a while. His presence not only cements friendship ties, but it also educates the beginner, and frequently broadens and educates the experienced person also. The presence at club meetings of an experienced amateur also does much to bring in the beginners and make the clubs' meetings successful. It may be regarded by some old time amateurs as beneath their dignity to attend radio club meetings at which the majority of the membership are at the crystal detector stage, but this is a wrong point of view to hold. It is part of his debt to amateur radio to attend radio club meetings, and he should so regard it. Once upon a time he was a beginner and he was very thankful for the association of those more experienced than he.

NEXT MONTH

Mr. Kruse's analysis of the data in the B. S.—A.R R.L. QSS Tests. ¶ "Bulb Oscillators for Radio Transmitters", by Prof. L. A. Hazeltine. ¶ Two splendid papers.

Don't Miss Them

The clubs themselves have a duty in this direction also, and that is to affiliate with our national organization, the A.R.R.L. Each club is like each individual member. There are beginner clubs and old timer clubs, and the latter owe to the former just that same thing which the older individual amateur owes to his younger brother.

This club matter should not pass without mention of the country amateur who is located too far from a town where there is a radio club for him to attend meetings. He should be reached just the same, for he is the forerunner of a great class which are going to make use of radio. He is away from the large centers and radio communication is more important to him than it is to the city dweller. Therefore, he should lose no opportunity to avail himself of as much information and assistance as possible. The way for him

(Continued on page 31)

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How to Tune the Honeycombs

By A. L. Groves

In this article Mr. Groves explains how he gets his results on the honeycomb coils—practical instructions on how to get the most out of this apparatus which will be welcomed by our readers.—Editor.

IT has come to my attention since writing the article on honeycomb coils for the March QST that the majority of bulbs require a larger plate coil than those given for the various ranges of waves, so it is best for each individual to select his own plate coil; which is an easy matter once the correct secondary value for a given wave or station is known.

I am also led to believe by the statements of many amateurs that they are not tuning the primary circuit as it should be tuned, and therefore do not get anything like the results they would get if the tuning was correctly done.

While it is impossible to describe every detail in the art of exceptionally close tuning, I believe the following will help a good many to practically double their range with the honeycombs, if a little care and patience is used until they become thoroughly familiar with the operation.

First we will suppose it is wished to tune to POZ. (I take POZ for example as most amateurs seem to hear him in some fashion.) We refer to the chart, Fig. 2 in March QST, and see the secondary condenser must be set around 46 degrees when using coil L-1500 in secondary. Then we put in a plate coil and close the coupling between the plate and secondary slowly until we hear a loud howl or bubbling sound. As soon as this sound is heard we loosen the coupling until the sound stops. If the plate coil used is too small you cannot hear the loud noise and a size larger coil should be used, and if you still can't hear it try the next size, and so on until the correct size is found. If on the other hand you put in a plate coil and hear the sound and can't make it stop by opening the coupling as far as it will go, you are using a coil too large and a smaller one should be tried. But results seem to be had when the howl starts with coupling open about half way; that is, about 45 degrees

Now after the correct coil is found the next and a most important part is to find the correct primary coil. With the secondary and plate coils tuned carefully as above, signals from long distances can be received without the primary being tuned exactly and a good many seem to let it go at that, thinking they are getting the full value from their set, and probably the best way to actually locate a station, if his signals are fairly strong, is in this way, as it gives broader tuning and makes stations easier to find.

We will now suppose the experimenter has L-750 in the primary circuit and hears POZ. He will then make some fine adjustments of the secondary condenser and plate coupling until he brings him in as loud as possible without actually tuning the primary. Then it would be best to loosen the plate coupling a fraction, say one-eighth of an inch, so as to avoid the possibility of the bulb being rendered insensitive when the full value of primary tuning is brought into use.

Now, with the primary coupling set at about 45 degrees, the experimenter proceeds to slowly vary his primary condenser from zero to maximum capacity, all the while listening for a sharp click in the phones. If no click is heard, try another size coil and again vary the condenser over the entire scale, and so on until a coil is found where the click is heard at some one point on the condenser scale. Until you can hear this click the circuits are not in tune and maximum results are impossible, but as soon as the click is heard signals will immediately increase and after this it is only necessary to make hairbreadth movements of the condensers and couplings to amplify the signals to an extent never heard before. It will not be well for the beginner to try to make these hairbreadth adjustments too close at first, as often one degree movement of a condenser will cause the signals to disappear entirely or the bulb to howl unmercifully, but after he learns the approximate adjustments in the manner described he will gradually learn the necessity of care and patience and come to appreciate the value of fine tuning, for fine tuning it is indeed and it can be carried up to such an extent that the faintest signal can be heard several inches or a foot or so away from the phones and then when the least bit of static that is a fraction heavier than the rest comes along it will set the bulb to howling and the signals will disappear entirely. This is of course not used for ordinary copying or measuring signal strength of stations, as it is too delicate an adjustment, but I mention it only to show the possibilities of high amplifications and the value of fine tuning, which can be learned only by the experimenter himself after he has once

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learned the correct adjustment by the howling-and-click method described above.

The best thing to do is for the amateur to put the L-1500 coil in his secondary, set his condenser at zero, then find the correct plate coil that will give the howl (if no plate coil will give it, the plate leads connecting the plate coil should be reversed), then find the correct coil for primary that will give the click at some point on condenser scale. Take note of every adjustment when the correct values are once found. Then set the condenser at 2 degrees and again take note, then to 4 degrees, and so on up to about 90 degrees, of the secondary condenser scale. When this is finished you have the correct values for every wave from about 6,000 meters to about 17,000 meters. Then you should put coil L-1000 in the secondary and repeat the operation with the secondary condenser from zero to about 32 or 34 degrees. Then you will have the correct data for tuning to every wave from about 4,000 meters to about 17,000 meters.

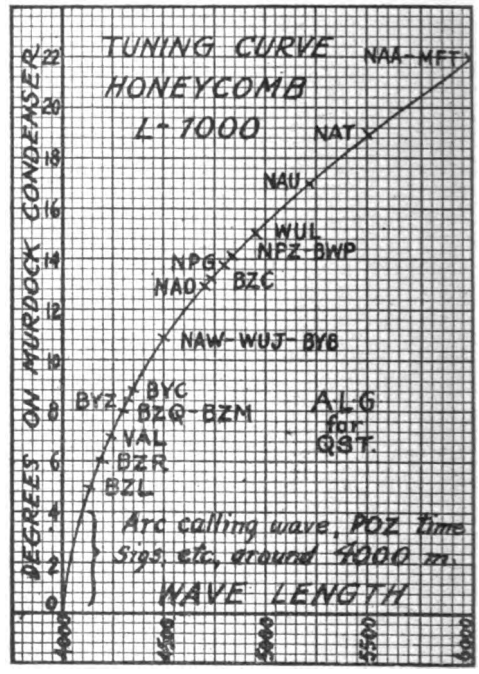
If it is found that there are some settings of the secondary condenser where it is impossible to obtain the click on the primary condenser, it indicates the capacity of the primary condenser is not large enough and a larger condenser should be used or two of them connected in parallel. I would, however, recommend one of the large Laboratory Type Condensers manufactured by Clapp-Eastham, of either .002 or .003 mfds., for the primary condenser. With a very small aerial a .001 mfd. condenser will do; with a medium aerial .002 mfds. is necessary; and with a large one, .003 mfds. is necessary.

However this trouble can be partly overcome, though signal strength will not be as good, by using a much larger coil in the primary circuit and putting the primary condenser in series. If this method has to be resorted to to obtain the clicks at certain settings of the secondary condenser, it should be the object of the experimenter to use as much condenser capacity as possible. That is, if you have to put in, say, L-1250 for a certain setting of the secondary condenser and you get the click with the series primary condenser say near 10 or 15 degrees, you should put in Coil L-1000 (a smaller coil) and see if you can't get the click with the condenser at a higher capacity.

I have often been asked if with a small aerial the European stations can be copied, and in this connection will say that with the honeycomb coils tuned as outlined above there is absolutely no excuse for anyone with even the smallest aerial (and a good ground) not being able to hear all of the high-power stations of Europe and Hawaii. I have in my room a coil of insulated copper wire one foot in diameter, 14 turns in the coil, about 40 feet of wire in all, and using this in place of the regular aerial all the high power stations including IDO, OUI, LCM, YN, NPM, etc., can be heard with the single VT. Signals are weak of course and it takes careful tuning to get them, but the mere fact that they come at all should be sufficient to put the ban on all fear that your aerial

ANOTHER CHART

of the L-1000 coil as a secondary up to 6,000 meters, which is the lowest wave of the L-1500 coil. This curve showes where to tune for the stations between 4000 and 6000 meters. It is also capable of tuning up to 15,000 meters, but at reduced signal strength, and coil L-1500 is recommended for waves above 6000 meters.



is too small. Even with no aerial at all, just tuning the primary coil to the desired station, all of the above stations have been actually copied on a single VT.

If the experimenter is in doubt as to the meaning of the howls and clicks referred to, he should put coil L-150 in the secondary, set his secondary condenser about 5 or 6 degrees, put coil L-100 in

(Concluded on page 36)

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In Introspect

SEPTEMBER is come. Again will the evenings begin to lengthen and the first cool breaths from the Northland warn us of what is on its way. Again will old snarling Father Static give signs of growing weary of his noisy job. Again will young men's fancy lightly turn to thoughts of something better in equipment. We welcome you, beautiful golden Autumn. You mark the opening of another new chapter in amateur radio and in this new chapter we confidently look to see the greatest accomplishments that have yet been recorded. It were well to draw apart for a moment, as we amateurs foregather here in the pages of our QST, and ponder our present and our future.

We as a body are at the high tide of our success. Through efficient organization we have built up the institution AMATEUR RADIO, until it has come to be recognized officially by our government. No less a personage than the Secretary of Commerce, one of the President's cabinet, has appointed our nominee as a member of a national committee to recommend a new radio law to meet modern conditions. We named our brother, Mr. Charles H. Stewart, of St. David's Pa., and Mr. Stewart has represented us in the conferences with all the other radio interests of the country in drawing up the terms of the proposed new law of which we shall hear presently. Who would have imagined such a thing possible a few years back!

As this number of QST is being mailed, our President and our Secretary journey to Chicago to attend a three day convention of the amateurs of the Eighth and the Ninth Districts. Never before have organized amateurs felt it possible to undertake a project of this magnitude. Philadelphia indicated what might be done last spring by getting together in convention the amateurs of the great Third District, the largest in the country. Boston paved the way for this sort of thing the previous winter by holding the first big amateur conference in Cambridge, when the amateurs from all over New England foregathered and enjoyed the privilege of meeting each other face to face and discussing their problems. Our President has already visited our brothers on the coast of the distant Pacific. This is all part of the preliminaries to a great national convention of amateurs that is coming some day. Maybe it will come this present season, for things have a way of happening quickly with us.

Technically, our stations have improved in ability beyond anything that the most optimistic of us would have imagined possible a short time ago. All during the past summer it has been an ordinary thing to hear Pittsburgh, Washington, Chicago, New York and Hartford working each other, not to speak of many other equally distant points. And all of this has been done on wave lengths below 250 meters. Continuous wave transmission, both straight and modulated by buzzer, is in nightly use, and it is a rare evening that the human voice and the strains of music do not come in over the air. Messages by the thousands are dispatched every night, and reliable communication over long distances by the ordinary citizen without the assistance of any public equipment or organization is an accomplished fact. This is CITIZEN RADIO as some of us dreamed it years ago. We call it "amateur" radio, but it is more than that. It really is the first instance of an independent, countrywide, citizen-owned-and-operated utility. Fellows, honestly, it is going some.

Before the year rolls around we expect to see tremendous improvement in reliability, in distance covered, and in the breadth of our field. We shall see transcontinental messages as common as interdistrict messages now are, we shall hear the voice used up to a thousand miles, and we shall see five radio stations where now stands one. It's a great game we are in, fellows. Let's stick and watch ourselves grow.

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East Meets West

FOR the first time since we have been organized, one of our officers has visited the West Coast, and sat down face to face with the fellows of the Sixth District. Mr. Maxim attended the Democratic National Convention at San Francisco and accepted the opportunity to drop in at a meeting of the San Francisco Radio Club. It has been one of our pet hopes to meet the Pacific amateurs and that we could not present upon this interesting occasion fills us with regret. For the first time in our history the Atlantic sat down at the same table with the Pacific and each was able to see the kind of man the other was. For years we have read of each other but had never seen what the other fellow looked and acted like. We understand Mr. Maxim listened in at Brother McGown's station. We envy him the privilege of hearing a "six" call. It and the seven have never entered these ears of ours thus far.

It is evident that our Pacific brothers are possessed of that vigor which goes with things of the West. They not only seem to have radio club meetings all the year around, but they have large and commodious quarters, in which to meet. At the San Francisco Radio Club, where Mr. Maxim made an address, it might be well for the rest of the country to know that they have in addition to a large general meeting room, an operating room and a Board of Directors' room. We understand that dues are levied and collected which provide enough funds to pay rent and do things properly. This strikes us as something which clubs in the rest of the country should note. In the east, it seems to be taken for granted that a radio club is a little boy proposition and that it cannot afford to charge but a few cents a month for dues, or else no one would attend. This hampers everything, and is a little way of looking at things. Our western brothers take the ground that unless it is worth doing in a big way, it is not worth doing at all There is something to think about in this.

From reports received from the coast since our President's visit, we gather that much good was done by the get-together. For the first time it was possible for some one who really knows the facts from the beginning to the end to tell the story of our A.R.R.L. It is a good story, and the absolute honesty and sincerity upon which our organization is built is very inspiring and promises long life. Others can talk about being "for, of and by the amateur" but after all, we ourselves are these amateurs and we are for, of and by OURSELVES. We do not have to have some one else act for us. We are fortunate in being organized sufficiently to act for ourselves.

This visit to the Pacific by Mr. Maxim fairly well covers the country since Mr. Smith our traffic manager has already visited the south, southwest and middle west. Thus the bonds of fraternal organization are being gradually cemented more and more firmly together. It is a good thing, because some day we amateurs are going to need each other. "In union there is strength", and we welcome everything that makes toward building up a solid front to present when efforts are made to curtail our activity.

Don't Forget Our Advertisers

THIS issue of QST, in addition to marking the increase in activity incident to the nearing of Fall, makes a new high-water mark for our volume of advertising.

Of course we have to use high power to get it, but QST is QSA-very with our advertisers, and for a very splendid reason; in nearly every case QST is producing better results for them in actual business than the other places they can spend their good money. The credit for that belongs to you fellows, and we here are sincerely grateful for your help. It shows what a little co-operation will do. By buying from those manufacturers and dealers who by their support make QST possible, and never failing to mention ol' QST, we have built it up to its present status. The limit is nowhere in sight. It pays, men! Every month some new companies present their offerings to the A.R.R.L., and the reputation of QST as a result getter is fast spreading.

Help us here to keep QST the biggest and best practical amateur magazine in the world. To do your part, buy from QST's advertisers and tell them to credit it to our QST. We're getting there!

Counterpoises

WHY don't more of us use counterpoises, we wonder?

The few amateur stations we know who are using them are getting good results, and it appeals to us as one of the things we may take into consideration in our efforts to get our stations in tip-top shape for the winter's work.

Zenneck differentiates between three kinds of soil: permanently moist ground of good conductivity; poor ground but with underlying water at no great depth; and ground of very poor conductivity without water under it at any reachable depth. In the first case a good conductive ground is easily obtained, and furthermore a counterpoise would be undesirable because

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of the losses in the ground by absorption. In the second case a counterpoise will be better than a ground unless a good contact with the wet strata can be secured and the same lie close to the surface. In the third case the counterpoise is the only feasible method for satisfactory work.

Between the antenna and ground, lines of force are set up, passing without loss thru the air but setting up currents when they flow thru a conductor, and so it is essential to see that the path provided for them thru the soil to the lower end of the ground-lead be of minimum resistance, to keep these ground current losses as low as possible.

Now in the case of good moist ground, there is no place for a counterpoise. We purposely bury it to save the losses of absorption—so that the currents are not induced in the ground but are actually part of the oscillating antenna current. But if we are not sure that we are getting a real good contact with an area of low resistance underlying our entire antenna, then a counterpoise will improve our operation. In the case of soil of very poor conductivity, the action of the counterpoise is to give us the old familiar "oscillator with an insulated conductor of great capacity at one end"—an arrangement having a very favorable current distribution and making excellent work possible where without it most of the energy would be dissipated in ground losses.

A little thought will show that in any case except that of soil of very good conductivity, the presence of a wire network under the antenna to conduct the currents to the ground connection will save all these losses. It is essential, however, that the network be really insulated from the ground, for if this is not done, the current will then flow to the ground under very unfavorable conditions due to crowding many lines of force into a narrow path, and the loss of energy will be relatively large.

Really, we very much doubt if any amateur ground layouts, except those whose industrious owners have buried a complex network of conductors in moist earth under their aerials, have anywhere near a good enough ground, and to these men the counterpoise offers a big increase in results.

The Bureau of Standards

ONE of the things we found out when we got into contact with the Bureau of Standards at Washington was that politics had cut the appropriation which runs the Bureau to less than one-half what was necessary to keep the establishment going on the same plane it has been running for some years past. Most people do not know this. If they did there would be a howl, because the Bureau of Standards is the hub of our scientific wheel in this country. We are a nation of money makers, and as a general rule we do not go into research work very much unless it is dead sure to earn a dividend. When there are a lot of things about which we ought to have the facts, we have to wait until somebody in Europe finds out what we want to know and is kind enough to tell us, or we have to go to our own Bureau of Standards. Cut down the latter to where it can no longer function properly, and we are right back again where we were some years ago, before we had the Bureau.

It is a poor piece of business, it strikes us, this trying to make a political showing of economy by cutting down to less than one-half a government department which is doing for the people at large what the Bureau of Standards is doing. From establishing proper standards of purity in food all the way to establishing and verifying radio transmission formulae, the Bureau is helping every one of us. The work it has done in radio alone is an indication of what it is doing in every other field of human activity. Among the different things they are working on now are: comparison of various types of antennas, methods of measuring received radio current and signal intensity, properties of electron tubes, definition and measurement of electron tube detector co-efficients, design and construction of electron tube amplifiers, modulation of electric currents with applications to radio telephony, improvements in power tube circuit design, properties of insulating materials of the laminated Phenol-Methylene type, and study of radio wave phenomena by measurement of variations of wave intensity and direction, which is our A R.R L. and Bureau of Standards Fading Test. This is only a very small part of the work being done in radio. In almost every case, a pamphlet is printed giving all of the information collected and on the average pamphlets are obtainable by any American citizen from the Superintendent of Public Documents, Washington, D. C., for the munificent sum of one dime.

This is one of the places where we radio people can show our influence in attempting to cure a great wrong. We are interested in what the Bureau of Standards' radio department is doing, and we can not only help that department, but all of the other departments of this fine establishment by talking this thing around and getting as many people as possible to definitely write to their congressmen and senators and urge that at the first opportunity the Bureau of Standards appropriation be put back where it was.

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THE OPERATING DEPARTMENT

J. O. SMITH
Rockville Centre, L. I.
TRAFFIC MANAGER.



IT has been the writer's great desire, for a long time, to see the traffic lines of the League perfected into a dependable, year-round means of communication, which like the great railroad systems of the country could be depended upon, regardless of weather or season. This condition has at last been realized, for during the summer just gone relay work went on as usual, as though the months had been January and February, instead of July and August where the peak of the QRN curve is reached. As an instance, on the nights of August 4 and 5 relay work was being done between stations of the First and Second Districts, between the First and Third, Second and Eighth, Third and Eighth, and possibly between others that the writer is unaware of. The amount of work as a whole which has been done this past summer has definitely established the fact that amateur relay work can be successfully carried on during the entire year —that there is no longer any such word as "season", so far as amateur radio is concerned. The word "season", in connection with amateur radio, is now only of historic value. It is a term once used in an age that is gone for good.

The QSS tests of the League have been carried on very successfully, the entire membership of the traffic department having taken an active interest in the efforts the League is making to solve the question of fading. Aside from being interesting work, all those who took part can feel that they have helped solve one of the greatest radio problems known, and the work they have done may prove of the greatest value. It must not be overlooked that aside from the tests made by the League for the Bureau of Standards, this is the first attempt ever made to collect definite data on this important question, and, certainly, the tests made are the most comprehensive and the best organized effort ever made by any radio organization to obtain definite data on abnormal and fading signal strength.

The C. W-izing of amateur radio is progressing rapidly. From the number of inquiries received by the writer in connection with C.W. transmission, it would seem that the entire male population of the continent of North America, also a few, even, of the Superior Sex, are going to install C.W. sets very soon. The greatest drawback so far in C.W. work has been the inability to secure power tubes. The writer was recently assured by an official of one of the large radio manufacturing companies that probably by October there would be an abundant supply of power tubes available of 5, 50, 100, and 250 watts capacity, at prices within reason. Throughout the summer, when QRN was at its height, C.W. transmission and reception was easily carried on when spark sets were absolutely useless. There is, everything considered, nothing remarkable about the fact that amateur radio is turning rapidly to C.W. transmission when its many advantages over spark transmission are considered.

The reports of Division Managers, telling in detail how relay work was carried on during the summer in the various divisions, follow:

ATLANTIC DIVISION
C. A. Service, Manager

The QSS tests now in progress in the ARRL Divisions may bring forth much interesting data due to their widespread character.

It is rumored the new call books will be issued some time in August or September by the Department of Commerce; we can all appreciate what a help this will be to amateurs.

Conditions in the southern section of the Atlantic Division at present are almost at a standstill, due to several causes; namely, absence of station owners on vacations, unusually warm weather, and heavy static interference. In addition to these conditions the recent removal to Norfolk of Mr. Malcolm Ferris, and his consequent resignation as District Superintendent for Eastern Pennsylvnaia, has temporarily left the Eastern end of Pennsylvania without a Superintendent in charge.

Mr. R. C. Devinney, Superintendent of Western Pennsylvania District, reports that traffic is light at present, though weather conditions allow work to be done in that section several nights each week. He reports that the Radio Engineering

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Society of Pittsburg held their Annual Outing on the 18th of July, which was a great success and at which a number of radio men from out-of-town were in attendance; also that there were some very fine radio sets exhibited including a radiophone set belonging to 8DR, using a motor generator set for power, operating from storage battery on an automobile. Mr. DeVinney mentions the fact that Mr. Burton P. Williams, 8EN, is absent on his honeymoon.

The report of Traffic Assistant Herbert M. Walleze, of Milton, Pa., who is acting District Superintendent of the Central Pennsylvania District in the absence of the Superintendent W. A. Cawley, states that no new stations have come to his attention that would be of service in promoting the relay work. He states that the station being erected at Danville, Pa., by Mr. Swayze will soon be in operation (Call 3ABD) and it is hoped that this station will be of assistance in handling traffic on Trunk Line B during the coming season.

Mr. E. B. Duvall, District Superintendent for Eastern Maryland, reports that station 3AN at Baltimore is out of commission due to his antenna having come down in a recent storm, and that he is now engaged in re-erecting same, and in overhauling his station for Fall work, and that Donald Primrose (3AA) has shut down his spark set, and is trying to get a C.W. set into operation, and also that 3HG is closed down during owner's absence for the summer. Mr. Duvall states that at a recent meeting of the Radio Section of the Maryland Academy of Science it was decided to hold a lawn fete in order to raise funds for the purchase of a complete station and laboratory for the Academy. He has been making frequent visits to Washington with a view to strengthening co-operation between the Baltimore and Washington stations, and has furnished considerable information of value regarding Washington amateurs available for appointment as District Superintendent in that territory.

The station of the Assistant Division Manager—3ZS—is at present out of commission, due to necessary repairs to transmitter, but it is hoped that after these repairs are completed the operation of the set will be more efficient than was the case during the past Winter. It is expected that the station will be in commission by the middle of August at the latest.

It is very important that there should be an appointment made of a District Superintendent for Eastern Pennsylvania in the very near future, and is a matter which is receiving the thoughtful consideration of the Assistant Division Manager, and any suggestions along this line or information concerning available candidates will be gratefully received.

NEW ENGLAND DIVISION
Guy R. Entwistle, Manager

Have you got your pin yet?

The greatest local radio activity in the New England Division this month seems to be centered around Lynn and Salem, Mass., where F. Clifford Estey, President of the Essex County Radio Association, has called several meetings of the various chapters of the larger association for the purpose of organizing the radio men of Essex County. Law and Order is the motto of this enthusiastic club. At an executive meeting held recently the following well known radio men were elected as honorary members: Rear Admiral S. S. Robison, U. S. N., Lieut. Commander J. B. Will, U. S. N., and H. C. Gawler, U. S. Radio Inspector for the First District.

A campaign has been started against disorderly operators who operate unlicensed stations, or cause willful QRM with licensed stations and those who use profane language over the air.

Three classes of members are provided for: Honorary members, who must be men of recognized ability and have rendered a service to the radio field; members, who must have an active interest in wireless and operate stations; associate members, who may be any person with an interest in wireless or electricity whether or not they have a station. This class of membership will allow anybody with the proper interest to attend the meetings and reap the benefits of talks and discussions.

Pulley reports traffic conditions as being in good shape for this time of the year, 1CK, 1DQ, 1DY, 1DR, have been handling traffic to the Second District. 1HAA is back on the job, but does not come in so QSA. Worked 1FB, near Portland, but can't seem to raise 8th, 9th, or 3rd district men who are heard up here. Most of the traffic to New York goes through 2JU, 2OA, 2BK, 2TF. 1ES is beginning to do some work with 1HAA. We are hearing Rawson's old Telefunken 500 cycle set now in use at 9ZN, Chicago. 1AR and 1DH have C.W. sets now. Lloyd W. Green of Cambridge will open up with a C-W set soon.

1AE has been fooling around with his spark coil while waiting for a motor-generator for the C.W. set and worked 1HAA from Duxbury, some 20 miles. The Boston traffic is QRZ so haven't worked north due to the pocket that must exist.

Bates reports Old Man Staticus active in Worcester and that both QSR and QSS bad through his district lately. Hays worked 1FV, 1CM, 1TS, 1AW, 2JU, 2OA, 3HJ. Who in Boston and vicinity can work a daylight test? He reports having taken a message from Lynn via 1CN, 1TS, 1CM to 1GY, but that sure is a long distance message from home. (Better than

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hanging it on the hook for a month, eh boys?) Worcester has bid for the New England A.R.R.L. convention of relay officials in September. Those wishing to attend, which means everybody who can possibly get there, can obtain the date and place of meeting from Lee A. Bates, 8 Moen Street, or the writer. Let's start off the season with a bang.

Castner writes from Portland of a continuation of the radio enthusiasm recently exhibited in his district. 1FB and 1FV can handle anything coming this way and 1UQ is about ready to be on continuously with 1KAY. Alexander, of the Bangor section, is at the B&A RR offices during the summer and will line up in that territory. 1BK recently had the decrement of his appendix measured and being over two-tenths had it removed. We wish him a speedy recovery.

3Z, of Farnham, Quebec, has left the key for a while, but will return in the early fall. Cummings, at Prouts Neck, is established for the summer and will be a valuable addition to our relay men. The present relay route is coming into Maine to 1FB, or 1FV to 1CAO, etc. L. E. Felker of Madison, Maine, an old timer, writes regarding a bewildering long wave station that sends press every noon on about 15,000 meters. Sends FFFFFFFF and stutters at the key in great style. Felker says no wonder a man misses his booze when he listens to a ham at the key of a commercial station. Can any one help him out?

Assistant Division Manager, 1TS, Donald Mix, Bristol, Conn., says activity around his section has slackened up a bit. Vacations and QRM are the apparent reason. 1FQ has not been on as much as usual, and our old stand by, 1AW, has even been heard less, as Mr. Maxim has been on the West coast listening to the 6th district stations. It will be interesting to compare the different conditions of QRM and QRN when Mr. Maxim returns.

Messages have been exchanged freely with 1BM, 1FW, 1QN, 1FAQ, 1FQ. 1GY continues to come QSA, but QSS here in Connecticut. Several Maine stations come in QSA also at 1TS, such as 1EK, 1KAY, 1LAX, 1FV, 1FB.

E. Standish Palmer, President of the Brown University Radio Club, writes of plans for the Fall at 1LAU. The university has a ½ KW rotary spark set and a two step amplifier. Providence has considerable QRM to overcome and some sort of a control station is being considered. Palmer suggests different hours for the different classes of communication and a visiting committee to go to the stations of the various amateurs who overstep and tune them up. This is a good idea. Help the young fellows out in every way possible. Make them feel as though we are helping and not trying to dictate to them.

Division Manager Lorimer, St. Lawrence Division, writes from Montreal that there is poor outlook at present for western messages through Canada. Traffic officials please note, and divert through other channels until further notice.

Much delay in answering correspondence will be prevented if the various amateurs write direct to the relay officials in their district. The division manager would like to correspond with all personally but it is a physical impossibility.

The habit of calling on the Division Manager when in Boston is encouraged as he is always willing to drop things for a few minutes and discuss radio with the out-of-town relay men. Better make it after two P. M.

ROANOKE DIVISION
W. T. Gravely, Manager

Since the last report summer static has arrived with all of its forces, and this, coupled with the extreme heat, has taken the keen edge off of all amateur operations somewhat, although many of the old guard may be heard pounding away any night. Nothing seems to stop them but I feel sure that the strong atmospherics will prove so troublesome that at least a few will turn their attentions to the question of static elimination, which may, eventually, lead to a solution of this problem.

Relaying is hard work in this division at present which is natural in a division where long jumps are necessary to get through, but the various stations may be heard every night, making efforts.

We are assured of one or two good stations in Richmond before fall, which will prove of much assistance in handling traffic. Prospects in Southwest Virginia are encouraging, while conditions in West Virginia are looking up.

Since the last report, Mr. F. L. Bunker of the Westinghouse Electric & Manufacturing Co, Charlotte, N. C., has been appointed District Superintendent of Southern, Eastern and Western North Carolina, and the A.R.R.L. is to be congratulated on having him as one of its Superintendents. (8XK PLEASE NOTE). Mr. Bunker's call is 4CE, and all stations in his territory are requested to communicate with him in future.

No definite working lines will be announced in this Division until the organization is perfected, and the personnel thoroughly informed as to conditions in their respective fields.

It is hoped, however, that well laid plans will be developed very soon, at which time announcement will be made of the various stations which will operate over the lines.

Mr. Allan S. Clarke, Pine Street, Danville, Va., will assist the Manager during

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the coming season in the capacity of Traffic Assistant, and all matters pertaining to Division Traffic will have his supervision. Lines will be worked out on a practical basis, not a theoretical one, and before this can be done, a great deal of development and test work is necessary.

All District Superintendents report little of interest this month, but they say they are busy, and that a larger and stronger organization may be expected before the fall months.

District Superintendent Heck in W. Va., hasn't been heard from in days, and we are all wondering if he is trying to reach Mars on the sly, or if the potato bugs keep him busy. Will some one tell us?

Judging from the activities of 3FG, 3EN and 3GO, we may expect something unusual from them during the coming months. They are hard workers. We may expect several C.W. stations in the Division before the winter season opens.

Will the stations in North Carolina and West Virginia please get in touch with their District Superintendents as early as possible, and let them know that they are ready and willing to assist.

Summing up conditions, as a whole, I am inclined to think we have a great deal to be proud of, and should feel very much encouraged in the progress made in developing year-round lines of dependable communication.

WEST GULF DIVISION
Frank M. Corlett, Manager

Who wants to loan the Division Manager the price of a vacation??? If he had it he would be tempted to take one just to be in style. By the time this is in print those that have gone will no doubt be coming back and the rest will be going.

At the time of this report four of the A.R.R.L QSS tests have been conducted in this division and about as many reports from observing stations have been received. With the exception of 5ZU, Tilley, of Austin, all the sending stations have been right on schedule. Unfortunately Mr. Tilley could not meet the schedule on account of working nights during the summer. Some very interesting curves are being obtained between 5AO, Houston, Texas and 5ZC, Dallas, Texas. These tests are something worth while; every amateur station in the country may take part and help to make it a real success for the A.R R.L. If sufficient data is collected by the observing stations and forwarded no doubt in years to come when the cause, and probably the overcoming of the cause of fading signals has been accomplished, you may say with pride that you helped on the first nation-wide tests ever conducted.

The District Superintendents are sticking it out and making every effort to get things lined up as near as possible, for the big times we are bound to have this fall and winter. If they can't use the radio routes they are using the U.S.M. route. You fellows who are getting your stations ready for the relay work that is-to-be, don't forget to write your District Superintendent telling him what you have, so that you can be counted in on the various routes that are being planned.

District Superintendent Louis Falconi, 5ZA, of the New Mexico District writes that he has quit wasting good hot hours trying to catch the wee noise in with the LOUD crashes. Old Man QRN is working his station on a 24-hour schedule now. 5ZA also suggests that the QSS tests be conducted when a fellow can HEAR signals.

Raymond L. White, 5AP, District Superintendent of Northern Texas, is still enjoying his vacation and the association of Mr. W. H. Smith who is operator in charge of old 9ZF, the Colorado Wireless Association's station in Denver. Being away from his district, White, of course, is not in direct touch with traffic conditions; he expects to return to Texas the first of August and it is suggested that all station owners get in touch with him immediately so that their stations may be included on the various routes to be organized.

W. H. Tilley, 5ZU, District Superintendent of Southern Texas, makes a rather meager report on account of the scarcity of news. QRN is fierce. Four of the Austin, Texas, amateurs are at sea as operators. Several attempts have been made to hold the line open to Houston but little success as yet, although 5ZW at Houston, Texas, comes in real good in Austin at 7 A. M. 5ZU will be on watch every hour on the hour from 8 A. M. to 1 P. M. for a few minutes each time so if any A.R.R.L. traffic for Austin is on your "pins" there is your chance to move it. Appointments are in order for this district but nearly everyone is out of town so it is hard to get replies to letters or make any definite arrangements.

The division headquarters station, 5ZC, sends the U. S. Weather Bureau forecasts and Highway Weather Bulletins every evening 7 P. M. 375 meters, (Sundays excepted) and immediately following this schedule broadcasts A.R.R.L. items of interest to the stations throughout the division. All stations should QRX for this schedule.

MIDWEST DIVISION
L. A. Benson, Manager

The writer is very glad to report that keen interest is being shown by all stations appointed on the QSS tests. Reports are continually coming in with few exceptions where it was impossible to transmit owing

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to bad electrical storms sweeping through this section.

Stations are beginning to roll in as in midwinter and traffic is starting to move in all directions. Several messages were handled direct through 5YH, Camp Pike, Ark., 4BZ, 9EL and 9HT.

Mr. J. G. O'Rourke, District Superintendent Eastern Nebraska, reports that he can freely state that his district is waking up. Not much traffic has been handled in the past month, but the interest taken by a majority of the station owners of his district in the establishment of permanent traffic routes has far exceeded his expectations. To date, two traffic routes through this section have been proposed as follows; No. 1, East and West, through southern section of district: Omaha—Wahoo, thirty miles; Wahoo—David City twenty-two miles; David City—Stromberg, twenty-four miles; Stromberg—Central City, eighteen miles.

STATIONS: Omaha:—9SC, 9HT, 9VE, Wahoo:—Wahoo Radio Club; David City, 9AEU; Stromberg, 9AFX; Central City. ??.

No. 2—North and South, through eastern section of district: Plattsmouth-Omaha, nineteen miles; Omaha—Blair, twenty miles; Blair—Oakland, twenty-two miles; Oakland—Wayne, thirty-five miles; Wayne —Niobrara, fifty miles.

STATIONS: Plattsmouth, Mr. Parmele, Omaha 9SC, 9HT, 9VE., Blair, 9AJS, Oakland, Mr. Johnson; Wayne, Wayne High School; Niobrara, ???.

Route No. 1 to connect with east and west route through southern part of Iowa.

Mr. J. A. Wanek, District Superintendent, Western Nebraska, reports an excellent station being erected at Hyattsville, Wyoming, by Dr. L. G. Van Slyke. It is admirably located and a good connecting link between the Midwest Division and the west coast.

Mr. Wanek states that he has been very busy gathering in the crops but never fails to be on the job after sundown. He is working hard to wake up some of the dead ones in his district and expects to have them on traffic routes before another moon.

Mr. H. L. Owens, District Superintendent, Eastern Kansas, is overhauling and replacing with new apparatus his entire outfit and will have things in fine condition when the heavy traffic starts. Mr. Owens refuses to be lost in the shuffle. Mr. Shultise, 9NX of Wichita, has sold his spark set and is going to install CW modulated for the coming season. He is tired of repeating messages so often and is working for that knife edge wave to break through QRM. 9AEG of Eldorado, and 9BW of Wichita, will be very good relay stations this coming season.

On Friday, July 23, 9EL reports hearing two phones, one was reading base ball news to some other station and the second station was acting as relay for the two. Both phones were very QSA. He would like to know who were the operators of these respective stations.

Mr. G. S. Turner, District Superintendent, Western Missouri, is spending his vacation in Chicago. He is unable to make a report this month, but promises to make up for it in his August report, which he says will be a peach.

Mr. Stover, District Superintendent, Iowa, is working hard in his district and reports several good stations being erected that can be used to great advantage in his traffic routes.

The Division Manager requests all stations in Missouri, Iowa, Kansas and Nebraska to get into communication with him at once, so that relay routes can be laid out, doing away with long jumps and giving all stations a chance to prove their ability as relay stations.

NORTHWESTERN DIVISION

John Hertz, Manager
Royal Mumford, Acting Manager

The present wonder of modern times is that QRN is not in undisputed supremacy of the air. Thanks to many relayers whose ardor is undamped by poor conditions, the air has not been conquered by static, but is largely in control of the radio amateurs. We are more than proud of the fact that the usual solitary reign of QRN, instead of being in the height of its glory, is overshadowed by the unrelenting determination of the 2000 meter enthusiasts.

We find conditions so unfavorable that, at times, we cannot overcome them, but at other times the QRN slackens up a bit and conditions more nearly like mid-winter prevail for a short period. Then we break through to those on the other end of the line who have been waiting as patiently as we, and although we lack the number of stations needed for short jump relay routes, we put the business through just the same.

Most of the business south during the past month has gone via 1CR, 7CW, and 7CU. Any one of these stations works Ukiah, Calif., with ease most of the time. These stations have recently handled A.R.R.L. traffic direct with Sacramento, stations near San Francisco, and as far south as San Jose, a distance of nearly 600 miles, through static that all but made the work impossible.

In Seattle, 7BK, 7AD, and 7AN, and in Tacoma, 7BC, and 7CE, all handle messages to stations in Portland and Silverton, Ore., and 7BK has lately covered the jump to California direct. In Lacey, Wash., we have 7YS back on the job after his summer vacation and he is always dependable

In Portland we have a number of good relayers, 7CR, 7BP, 7DS, 7DG, and 7BR,

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relayers, 7CR, 7BP, 7DS, 7DG and 7BR, who can be depended on to handle traffic for Seattle. Both 7CR and 7BP work California stations direct in spite of poor radio weather.

Jack Woodworth, 7CC, District Superintendent, Moscow, Idaho, reports that very little relay work is being handled in his district because of the heavy QRN. In Moscow we have 7AL and 7CC who have done good distance work. Two new stations in Pullman, Wash., 7BQ and 7FI, have been picked up by receiving sets as far south as the sixth district. These stations can handle business to Pullman State College, of that city. He also says that many new stations are in course of construction which shows the general tendency toward increased activity in radio work with the coming of better conditions.

Currie N. Teed, 7FT, District Superintendent, Kuna, Idaho, reports that very little activity has been shown by amateurs in southern Idaho during the last month, as he has heard only two stations, 7HJ and 7GY, both of Boise, Idaho. He has been hearing radiophone conversation lately, probably from the Government forestry service sets. The speech is clear and strong; the buzzer modulation is painfully loud. No amplification other than regenerative was used.

Olfan DeGuire, 7CW, District Superintendent, Silverton, Oregon, reports that most of the amateurs of southern Oregon are doing only local work. He reports two promising relay stations, one of Mt. Angel College, at St. Benedict, Ore., the other at Silverton being put up by Alfred Adams. Both these stations are one K.W. The Mt. Angel College station has already made tests with 7YS with favorable reports.

At Astoria, Ore., we are promised a station which is being put up by Percy Dann, a pre-war DX from Portland.

Old 6KL, William Wood, now 5BR of Vancouver, B. C., reports that Canadian regulations are somewhat more stringent than those of the U. S. He is transmitting with ½ K.W. on 100 meters and hopes to connect up with some of the "sevens" that are QSA with him.

Mr. Redeker, 7YA, 1213 N. 17 St., Boise, Idaho, has been appointed City Manager. He uses a 2 K.W. transmitter and has been heard in Phoenix, Arizona.

Mr. Teed reports that he has discovered the origin of the radiophone conversation which he mentioned. It is the Wm. Wrigley station Avalon, Catalina Island, Calif.

The fading tests have stimulated summer work to a remarkable extent. Through these tests many amateurs find that the only reason they have not been hearing many long distance stations was just because they were not on the job to take advantage of the times when the old bug-a-boo-QRN slowed down a bit.

ONTARIO DIVISION
A. H. K. Russell, Manager

The summer holidays have hit this division very hard this year and there is practically no radio work going on, with the exception of a bit of testing with C.W. sets.

The Manager had the pleasure of attending the inaugural meeting of the new radio club at Brantford, and while there arranged with Mr. W. K. Mitchell, the Secretary of the new club, to act as District Superintendent for Southern Ontario, and to try and link up with Toronto and Windsor as soon as things get going again in the fall. All the amateurs in Brantford, the "Telephone City", as it is called, are full of enthusiasm, and should give a good account of themselves in relay work in the fall.

As they used to say in the late war: from the rest of the front there is nothing to report.

OUR LESS EXPERIENCED BROTHERS

(Continued from page 20)

to do this is to join a club or our national organization direct, receive his QST regularly, and keep in touch. Some day he will be an important point.

Another matter which should be dwelt upon in a discussion such as this, is the subject of taking out government licenses. The rule that is applied is that a provisional license with official call letters is granted an amateur by merely applying for it, provided he is more than forty miles from the point where there is a government radio inspector. It thus is a simple matter for any one to secure official call letters, own a government provisional license, and be identified in the radio world. His name and address is in the record and he at once secures all of the advantages which come from this fact. Moreover, it gives the government data of great value in time of public peril. It should be the aim of every amateur to install some form of transmitter, however small, so as to secure the advantages and prestige which go with an official call, and help on Amateur Radio by lending his weight to the active field.

All of the above can be seen to point directly at the necessity for organization, in all that the term implies. The time will come when we amateurs will all be so intimately in contact with each other through our appreciation of the value of efficient organization that it will be the practice of police departments to ask our aid in broadcasting such things as automobile thefts. What could be more rapid

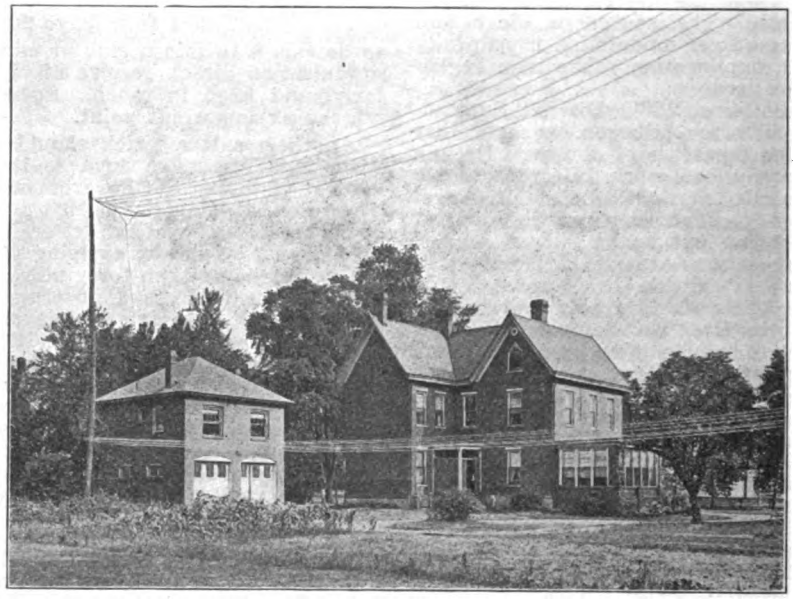
(Concluded on page 39.)

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8XK, PITTSBURGH, PA.

8XK, owned by Mr. Frank Conrad, of Pittsburgh, is one of the star A.R.R.L. stations of this summer's season and will unquestionably continue among the top-notchers this winter. The signals of 8XK during the QSS tests have been received in New England with terrific intensity, and, taken all around, its whole performance is a splendid argument in favor of C.W. transmitters. That being our favorite topic this season, it is with the greatest pleasure that we present the following description of Mr. Conrad's station, feeling that A.R.R.L. men who want constructional hints for building a C.W. set capable of long distance relay work will find a world of aid therein.—Editor.



AS its call indicates, this station is primarily devoted to experimental work in connection with radio transmission and reception. The various sets are simply assembled on the table from the available stock of parts, such as condensers, inductances, etc. The antenna consists of an inverted "L", used in conjunction with a counterpoise in place of a ground. The flat-top of the antenna consists of six wires, two feet apart, one hundred and five feet long, and fifty feet high. The counterpoise is a duplicate of the antenna, except suspended at a height of twelve (12) feet. This arrangement gives a very high ratio of radiation resistance to losses, and also permits of operation at short wave lengths without the use of a series condenser. The resistance at 250 meters is 8 ohms.

The transmitting apparatus, as shown in the illustration on our cover, comprises

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a radio telephone set, a spark set, and an I.C.W. set.

The telephone set, at the right of the photograph, uses two 50 watt power tubes, the plate circuit of which is supplied by a 1000 volt D.C. generator, a 5 watt tube being used to amplify the audio-frequency

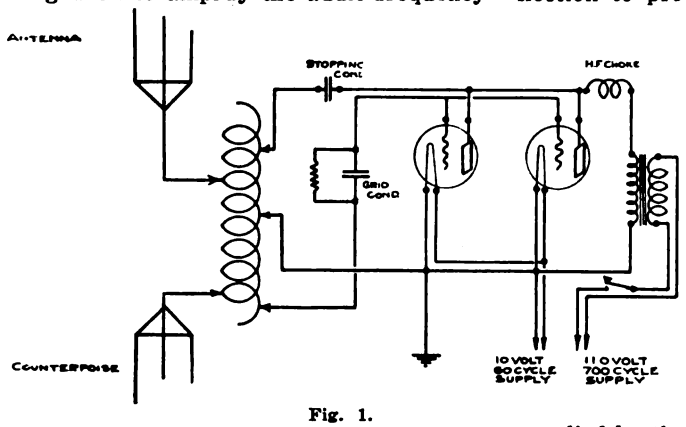


Fig. 1.

current delivered by the telephone transmitter. This set gives an antenna current of 3½ amperes, when connected for telephone operation,—one of the tubes operating as oscillator and one as modulator. When connected for CW transmission, both tubes operating as oscillators, the antenna current is 5 amperes.

The spark set, in the center of the photograph, consists of the usual arrangement of power transformer, condenser, rotary spark gap, and oscillation transformer. The power transformer steps the supply voltage up to 7300 volts and is 1 K.W. capacity. The comparatively low secondary voltage is made possible by adjusting the transformer and condenser circuit to resonance to the spark frequency. The condenser is a Dubilier Mica of .01 M.F. capacity. The spark gap has eighteen stationary contacts and a rotating arm which runs at 3600 R.P.M., thus giving approximately one thousand (1000) sparks per second. As now adjusted for 250 meters, the set gives an antenna current of 7½ amperes with a decrement of about .05, the power input to transformer being about 960 watts.

The I.C.W. set, shown at the left of the photograph, is the one which was used as transmitter for the Bureau of Standards—A.R.R.L. Fading Tests, during the months of June and July. This is a vacuum tube set, in which modulation of antenna current is obtained by supplying the plate circuit from a 700 cycle generator, in place of the usual D.C. generator. The set comprises two vacuum tubes, operating in parallel, and direct coupled to the antenna inductance, the connections being as shown in diagram, Fig. 1. A condenser of .006 M.F. capacity is interposed in the plate connection to prevent short circuiting of the 700 cycle power supply through antenna inductance, and a condenser of .0005 M.F. capacity, shunted by a 7000 ohm resistance, is used in the grid connection to give the necessary negative grid voltage. The tubes are similar to the standard Navy type 50 watt size, except that the plate connection is brought out at the end of the tube opposite the base, in order to provide adequate insulation for the plate voltage used, which is 3000 volts effective, it being supplied by the step-up transformer shown. This type of tube is usually operated from a 1000 volt direct current supply, but by increasing the voltage as above, it is possible to so increase their efficiency as to about double their output without any reduction of life. A ground connection is shown tapped to the antenna inductance. This tap is made to a mid-potential point, between antenna and counterpoise, and no

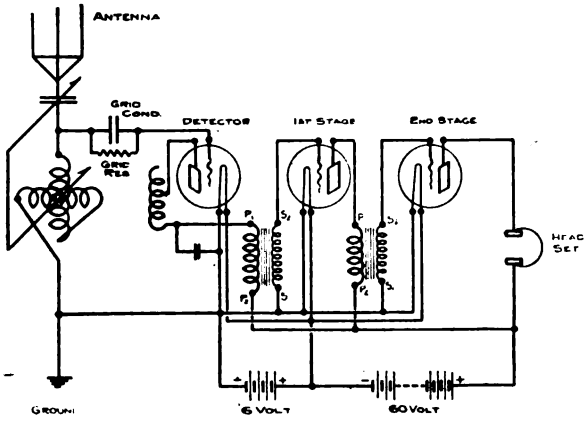
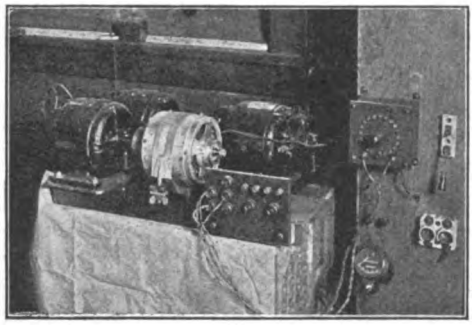


Fig. 2.

current flows through this connection. It insures that there is no radio frequency voltage between filament supply and other low voltage parts of set and ground, thus eliminating any losses from this source. This connection is not necessarily the middle of the inductance coil, as the lead-in from antenna and counterpoise form part of the total inductance, and the tap is made to the middle point of the total inductance,

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which, owing to the much longer lead-in from antenna than from counterpoise, brings this tap very near the antenna end of inductance.



The 700 cycle generator, which supplies the plate circuit, is rated at 300 watts, and is driven by a ½ H.P. induction motor. A single layer inductance is included in the secondary circuit of the step-up transformer, in order to prevent the high frequency current being by-passed through the distributed capacity of the transformer windings. This inductance and the leakage inductance of the step-up transformer, are, in connection with the .006 M.F. plate circuit coupling condenser, adjusted to 700 cycle resonance. It, of course, would be possible to operate the plate circuit from the 60 cycle supply, in which case, however, the received note would be 120 cycles and would be of very low audibility, unless beat reception was used.

The power for filament supply is taken from the 60 cycle power circuit through a step-down transformer, which delivers 10 volts to filament terminals.

As adjusted to 250 meters for the Bureau of Standards—A.R.R.L. Fading Tests, this set delivers to the antenna a current of 6½ amperes, with an output from the 700 cycle generator of 450 watts.

The receiving equipment is mounted on a table, which is normally in front of the transmitter, but which was removed before photographing, in order to show the transmitting apparatus. As in the case of the transmitter, it consists of a table assembly of parts to make up the particular scheme desired. The equipment generally used for ordinary short wave reception consists of a single circuit receiving tuner, used in connection with a detector and a two-stage amplifier. The scheme of this set is shown in diagram, Fig. 2. Having but one tuned circuit, the operation of finding a station of unknown wave length is reduced to the minimum, while the selectivity and response to weak signals is fully equal to that obtained by the more complicated circuits in general use.

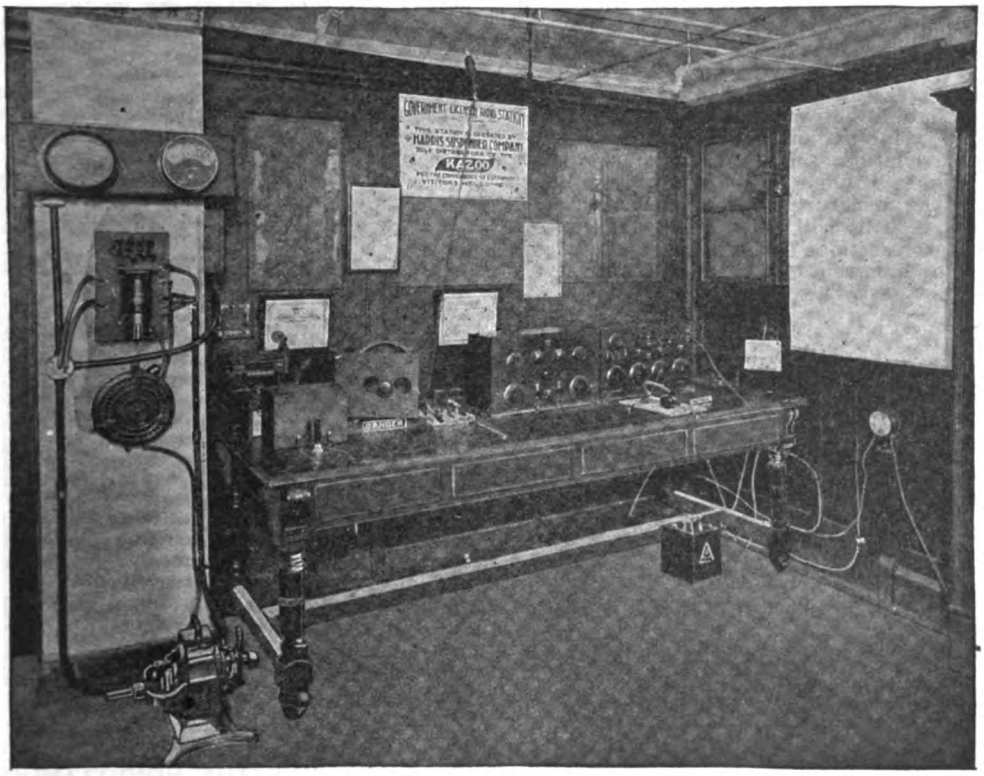
2NW, NEW YORK CITY

Here is a very efficient station which has been installed by Mr. Ralph Brooke Austrian for the Harris Suspender Company of 694 Broadway, New York City. The company furnishes buyers who come to its showrooms with the latest news, time signals, etc., as well as accepting messages from them for transmission to their families via the A.R.R.L. The station is one of the few in the New York district which is open for business during the day. Operating hours are 12:00 noon to 1:00 P. M.—4:30 to 5:30 P. M. At present the station is closed evenings but will be ready for all night work this fall.

The antenna is of the fan type consisting of nine wires of stranded phosphor-bronze insulated cable, supported by two towers on the roof of the building, the lead being carried down one flight to the top floor, where the operating room is located. The ground connection is made to the frame work of the building which is all steel and furnishes a good ground.

The transmitter consists of a 1K.W. Type T. Thordarson Transformer, Murdock moulded condenser 5 sections, Benwood rotary gap in an extra muffling drum, Clapp-Eastham Radio Coupler, and a new 1 K.W. Rotary Converter. The one shown in the photo is no longer in use. The converter is started and stopped by an Industrial Controller Company's automatic remote-control starting box, push button type. The volt and ammeters shown are A.C. instruments and show power input. The normal voltage is 150 and the amperage from 3 to 10. With this set six amperes have been put in the aerial at a wave length of 205 metres with decrement of .2. The small light shown in front of the muffling drum containing the gap, lights when the secondary circuit is "live." The receiving units are separate sets entirely. One is Grebe's CR6 and the other his CR7. They are equipped with the automatic plug and jack control so the two step amplifier which is built into the CR6 set may be used in connection with the CR7. The CR6 is used for all relay work and also most of the 600 metre commercial copying. Amateur stations have been copied from all parts of the country. The CR7 has done exceptionally good work and signals from all of the European stations have been copied, as well as the Pacific Coast and Far East sta-

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tions. Marconi bulbs are being used as detectors and amplifiers. A Magnavox loud speaker has also been added and with its use it is possible to copy some of the European stations, including POZ, with ease from the next room.

Visitors are always welcome and are requested to drop in and make the station their headquarters when in this city.

A Few Ideas for Amateur C.W.

(Concluded from page 9.)

Heating Filaments From D. C.

The larger power tubes require a filament current which is a severe drain on a storage battery, and methods for heating the filaments with stepped-down alternating lighting current are going to be valuable. The disadvantage is the difficulty of eliminating the a.c. hum. One method of achieving this is shown in Fig. 11, where the grounded grid and plate connection is tapped from the center of the filament winding, both halves shunted by condensers, and a high-resistance impedance (an inductance wound with high resistance wire) connected across the whole. Very good results are being had in some cases we know without this arrangement, merely a connection to ground being tapped off the center of the secondary winding. More data on this shortly.

Motor-Generators

A motor-generator set continues to be the most satisfactory method of obtaining d.c. for plate supply where any considerable amount of power is necessary. Their high cost is a big burden on the amateur, however, and we want to call attention again to the good results which may be obtained from the use of an old d.c. motor as a generator. A 500-volt one would be best suited to average work, of course, but they are rare. 220-volt motors may be rewound for higher voltages, or driven at higher speed, or both. Generally about 400 volts can be got from a 220-volt 1800 r.p.m. d.c. motor when

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driving it by a 3600 r.p.m. induction motor. An external resistance should be placed in the field circuit to keep the current at the same value as obtained on the lower voltage as a motor, as it is practically at saturation and any additional current would be wasted. In the case of motors having two or three armature windings in parallel on each set of commutator bars, a higher voltage may be got by connecting the armature coils of each section in series. This will leave some unused commutator sections and will increase the generator hum, but not to an extent where it cannot easily be filtered out.

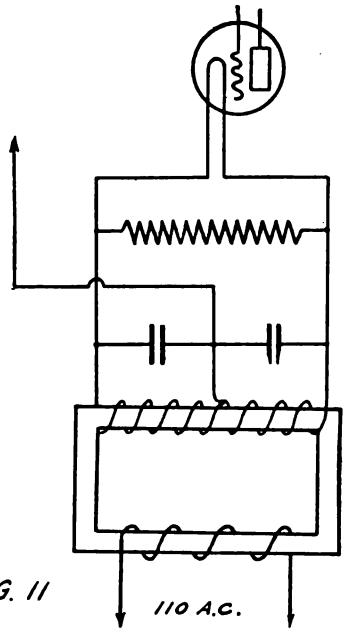


FIG. 11

If the unit is mounted on a base, and it is set on coil springs, most of the noise and vibration will be eliminated. We know one amateur who has his set mounted on the floor of a shallow closet in his room, the closed door making its operation noiseless.

On account of the almost inevitable short-circuits occurring in experimental work, it is strongly advisable to have the generator simple shunt-wound. A short will then draw all the current from the field and the voltage will drop, whereas a series-or compound-wound generator would likely be damaged, unless protected by fuses.

Suggestions

A word about the arrangement of apparatus. An experimental set can not well be a neat job, and it is best not to try to make it so while experimenting. Arrange your pieces of apparatus in orderly array on a table or bench, much in the relative positions in which they appear in a schematic hookup, and connect them up with flexible leads. The tube sockets can be placed in a row on a narrow base, wired up with binding posts at each end, and placed at the rear of the table where the tubes will be out of the way. Four candle-power carbon-filament lamps, with a resistance of about 3000 ohms, make good grid leaks. Meters are an absolutely vital adjunct to a C.W. set, and every station should have at least a plate voltmeter, plate milliammeter, filament ammeter, and radiation ammeter.

To minimize QRM to others, determine the constants of the aerial on which you expect to use your set, and construct a phantom or dummy antenna circuit on which all the experimental work may be done equally well. This will consist of a condenser (generally around 500 to 700 micro-mfds.) and a resistance (generally between 10 and 18 ohms) connected in series with whatever inductances and capacities are to be used in the finished set.

Keep a careful record in a notebook of all your experiments—the date, the circuit used, the readings of all the meters, and any reports on the results, such as modulation, distance, etc. Then when the final form for the finished set is determined, it may be constructed from the data and all the apparatus permanently built into a panel or cabinet set.

HOW TO TUNE THE HONEYCOMBS

(Concluded from page 22)

the plate, and close the coupling until he hears the howling or bubbling very loud; then open until the sound stops. Put in L-75 in the primary and put the primary condenser in parallel with the coil. Disconnect the aerial entirely from the set and open the primary coupling about half way or a little less. Now vary the primary condenser over the entire range from zero to maximum, and at some point on the condenser scale (should be about half way) a decided click will be heard and as long as the secondary condenser stays set in this place (5 degrees) the click will be heard every time the condenser pointer passes this place. Increasing or decreasing the capacity of the secondary condenser will make the click occur at a correspondingly higher or lower point on the primary condenser scale. The couplings and condensers should then be varied minutely until the click becomes very pronounced, in fact it is possible to reach such a point of adjustment that the click fairly hurts your ears and might be likened to lightning striking a phone wire at a little distance while you are talking, especially if sensitive receivers such as the Baldwin are used.

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QST'S DIRECTORY OF CALLS

In continuance of the policy recently announced, QST presents another two pages of calls, which may be cut out and kept with the January supplement if desired.

FIRST DISTRICT

Middlesex Motor Co.	440 Salem, St., Medford, Mass. (Correction)	1JV
J. R. Morse	234 Puritan Rd., Swampscott, Mass. (Correction)	1RT
Louis Sneiderman	184 Putnam St., New Haven, Conn.	1VQ
J. A. Grant	15 Elm St., Everett, Mass.	1VR
A. L. Huston	8 Hazelwood St., Waterville, Me.	1VS
W. R. Dresser	283 Main St., Calais, Me.	1VT
R. B. Grant	Cushman St., Monson, Mass.	1VU
W. N. Holden	84 Parrott Ave., Bridgeport, Conn.	1VV
N. T. Carr	633 Moody St., Waltham, Mass.	1VW
C. A. Tribbett	24 Foote St., New Haven, Conn.	1VX
A. A. Morse	563 Washington St., Bath, Me.	1VY
A. J. Franklin	664 Seventh St., So. Boston, Mass.	1VZ
C. S. Perkins	31 Mayflower St., Plymouth, Mass.	1WC
S. A Sweatt	69 Chestnut St., Cambridge, Mass.	1WI
Ralph C. Watrous	20 Diman Pl., Providence, R. I.	1WM
Ralph C. Watrous	Watchaug Pond, Providence, R. I.	1NN
J. W. Whitmore	64 Meadow St., Pawtucket, R. I.	1WO
P. W. Dickens	30 Rockland St., Roxbury, Mass.	1WX
A. M. Wallingford	901 Broadway, West Somerville, Mass.	1WZ

SECOND DISTRICT

G. A. DeCortin	16 Elm St., Mt. Vernon, N. Y. (Correction)	2FE
F. H. Giefer	Ravenhurst, West New Brighton, N. Y.	2GB
A. E. Sonn	282 Parker St., Newark, N. J.	2GC
G. C. Otton	58 Chichester Ave., Jamaica, N. Y.	2GE
J. C. Ruckelshaus	566 Ridge St., Newark, N. J.	2GF
C. P. E. Gruetzke, Jr.	1237 Brook Ave., New York	2GG
Henry J. McCue	76 St. and Shore Rd., Brooklyn	2GI
E. G. Cronemeyer	1269 Theriot St., New York	2GJ
J C. Ruckelshauns	417 Paige St., Schenectady, N. Y.	2GK
Wm. Grumbacker	514 W. 170th St., New York	2GM
Jno. H. Peitler	45-53d St., Corona, N. Y.	2GN
Thos. Martin	15 Troy Rd., Menando, N. Y.	2GP
Chas. T. Manning	81 No. Maple Ave., East Orange, N. J.	2GQ
John M. High	Riverdale, N. Y.	2GR
Geo. D. Stewart	90 No. Broadway, Yonkers, N. Y.	2GS
N. Y. Catholic Protectory	Walker Ave., Van Nest, N. Y.	2GU
C. J. Ripperger	147 Wisner Ave., Middletown, N. Y.	2GV
Frank X. Hayes	162 E. 82d St., New York	2GY

FOURTH DISTRICT

Jas. T. Morehead	Greensboro, N. C.	4CC
Carl D. Short	233 Wash'n Ave., Macon, Ga.	4DA

FIFTH DISTRICT

W. C. Hutcheson	Wind Rock, Tenn.	5DA
Robert Joseph Preis	2710 Marengo St., New Orleans, La.	5DB
C. E. Bland	Shreveport, La.	5DC
Emmett H. Koeble	723 Fifth St., East Las Vegas, New Mexico	5DD
Fred Whitlock	1203 Arizona Street, El Paso, Texas	5DE
Paul Bowvon	1401 South 20th St., Birmingham, Alabama	5DF
Coleman W. Gilliam	1220 Ash St., Birmingham, Alabama	5DG
H. W. Scott	734 Yale St., Houston, Texas	5DH
W. L. McAuliffe	3217 Washington Ave., Houston, Texas	5DI
Worthington Brown	1640 East Moreland, Memphis, Tenn.	5DJ
Edward S. Jackson	Box 425, Silver City, New Mexico	5DK
Hurlburt Still Electric Co.	1101 Capitol Ave., Houston, Texas	5DL
Willard Travland	Tuleta, Texas	5DM
Thomas Leonard Parkes	2411 Kensington Place, Nashville, Tenn.	5DN
Walter L. Wellford	205 So. Belvedere, Memphis, Tenn.	5DO
Jos. Henry Uhalt	5252 Camp St., New Orleans, La.	5DP
Felix Boizelle	2334 Milan St., New Orleans, La.	5DQ
Conrad Stein	816 West 15th St., Little Rock, Ark.	5DR
Danah Boyette	111 North 7th St., Lawton, Okla.	5DS

SIXTH DISTRICT

E. H. Needham	118 Fairmont Ave., Eagle Rock City, Cal.	6EO
S. H. Seeburger	371 60th St., Oakland, Cal.	6EP
F. W. Salome	1361 Underwood Ave., San Francisco, Cal.	6EQ
H. Blasier	3200-½ S. Hoover St., Los Angeles, Cal.	6ER
E. G. Underwood	903 E. Commercial St., Los Angeles, Cal.	6ES
Paul R. Fenner	1338 Masonic Ave., San Francisco, Cal.	6ET
F. L. Garrison	405 Willow St., Stockton, Cal.	6EU
A. A. Kramer	1603—6th Ave., Coronado, Cal.	6EV
C. J. Phillips	1016 San Antonio Ave., Alameda, Cal.	6EW
C. Steffen	1615 Arch St., Berkeley, Cal.	6EX
J. L. McCargar	1413 16th St., Oakland, Cal.	6EY

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G. R. Lee	2619 Manitau Ave., Los Angeles, Cal.	6EZ
Edw. L. Mundt	2418 Eagle Ave., Alameda, Cal.	6FA
Bert Diamond	408 S. Catalina St., Redondo Beach, Cal.	6FB
A. H. Schulz	1445 Cole St., San Francisco, Cal.	6FC
Hallie Midkiff	Minnesota St. and Ada Sts., Glendora, Cal.	6FD
Wm. Briggs	Anderson, Chasta Co., Cal.	6FE
R. B. Dugan	3003 LaSalle St., Los Angeles, Cal.	6FF
C. H. Hibbard, Jr.	156 Bellsfontaine St., Pasadena, Cal.	6FG
H. H. Steen	2007 K St., Sacramento, Cal.	6FH
Paul Oard	1217 N. East St., Stockton, Cal.	6FI
E. D. Barrett	960 18th St., Merced, Cal.	6FJ
DeLoss P. Trim	4033 Louisiana St., San Diego, Cal.	6FK
D. E. Metcalf	1825 So. Ardmore Ave., Los Angeles, Cal.	6FL

SEVENTH DISTRICT

J. Rooney	214 Olympic Place, Seattle	7CK
W. McMillan	157 Harrison St., Seattle	7CL
J. C. Vogler	122 Belmont, North, Seattle	7CM
W. W. Harris	543 No. Broadway, Marshfield, Ore.	7CN
G. W. Fitzpatric	3252 Ferdinand St., Seattle	7CO
I. Woolf	1905 Washington, Seattle	7CP
R. G. Stone	P. O. Box 616, Boise, Ida.	7CQ
E. De Nuef	4411 Juneau St., Seattle	7CS
H. S. Gagnon	409 San Rafael St., Portland, Ore.	7CT
H. S. Munford	518 Beach St., Vancouver, Wash.	7CU
C. M. Carlquist	1061 Concord St., Portand, Ore.	7CV
O. De Guire	Silverton, Ore.	7CW
L. M. Peck	4916 Wallingford Ave., Seattle	7CX
Ben Crawford	328 So. J. St., Tacoma	7CY
C. E. Fraer	88 Park Ave., Marshfield, Ore.	7CZ

EIGHTH DISTRICT

Chas. Wolensky	324 Lehigh Ave., Palmerton, Pa. (Correction)	8AA
Chester M. Wilcox	181 S. Fairview Ave., Lansing, Mich. (Correction)	8BB
Cleveland Yacht Club	11215 Clifton Blvd., Cleveland, O. (Correction)	8DF
Arthur M. Stellwagen	312 N. Jefferson St., Ann Arbor, Mich.	8FA
Robt. C. Devinney	1224 Boyle St., Pittsburg, Pa.	8FB
Donald L. Wood	310 Augustine St., Rochehster, N. Y.	8FC
Chas. R. Thompson	815 Wall St., Port Huron, Mch.	8FE
L. A. Bambauer	2917 Peach St., Erie, Pa.	8FF
Albert N. Hudson	406 Park Ave., Fulton, N. Y.	8FG
Walter I. Pardridge	3039 S. Washington Ave., Saginaw, Mich.	8FH
Orville D. Bower	834—4th St., Marietta, Ohio	8FJ
Norman E. Calkins	1422 W. 84th St., Cleveland, Ohio	8FK
Walter Wm. Mester	2170 W. 95th St., Cleveland, Ohio	8FL
Ernest and Albert A. Munch	105 Excelsior St., Pittsburg, Pa.	8FM
Wm. C. Babcock	112 Head St., Penn Yan, N. Y.	8FN
Carl E. Welsher	69 Ransom Court, Lockport, N. Y.	8FO
Frank A. Baumgarten	325 Melwood St., Pittsburg, Pa.	8FQ
Richard J. VerKamp	2815 Melrose Ave., Cincinnati, Ohio	8FS
Lloyd E. Furrow	420 Lake St., Troy, N. Y.	8FT
Fred S. Travis	1090 Wilhelm St., Defiance, Ohio	8FU
Clyde W. Thorpe	36 Grove St., Cobleskill, N. Y.	8FV
Cass Tech. High School	711—2nd Ave., Detroit, Mich.	8FX
Walter L. Leatherman	703 W. Main St., Van Wert, Ohio	8FY
Geo. W. Van Kirk	196 S. Washington Ave., Wilkes Barre, Pa.	8FZ

NINTH DISTRICT

William Wirick Harper	334 East Fourth St., Ottuma, Iowa	9GK
Harold E. Mase	3340 Dupont Ave., South, Minneapolis, Minn.	9GL
Donald Anderson Kent	DeWitt, Iowa	9GM
Arthur Brook Heman	5900 West Cabanne Place, St. Louis, Mo.	9GN
Donald H. C. O'Neil	5740 Bartner Ave., St. Louis, Mo.	9GO
Ralph Martin	818 Sheridan Road, Kenosha, Wisconsin	9GP
Leon Joseph Ostrander	1202 Lincoln Highway West, Mishawaka, Indiana	9GQ
Donald Roy Graybill	5608 So. Franklin, Polo, Illinois	9GR
James B. Holston	Nashville, Illinois	9GS
James Barnard Corum	Deering, North Dakota	9GT
Ethan Mark Turley	409 Harrison St., Lafayette, Indiana	9GU
Charles A. Wegner	6208 Washington St., St. Joseph, Mo.	9GV
James E. S. Hayes	220 West 4th St., Duluth, Minn.	9GW
Eddie Smith	688 So. 39th St., Louisville, Ky.	9GX
Ross Talbott Hatton	Box 320, Elwood, Kansas	9GY
Richard Eugene Mathes	4825—28th Ave., So. Minneapolis, Minn.	9GZ
John W. Smith	LeRoy, Illinois	9HA
Bert Frank Callender	1844 S. Lawrence Ave., Wichita, Kansas	9HB
Ralph Eugene Dexheimer	2130 North 6th St., Sheboygan, Wis.	9HC
George D. Bauer	2133 Weisser Park Ave., Fort Wayne, Indiana	9HD
Iden Monroe Kerney	725—6th Avenue, Council Bluffs, Iowa	9HE
Herman Fred Fedder	1440 West High St., Davenport, Iowa	9HF
Paul Joseph Kuprion	2625 W. Chestnut St., Louisville, Ky.	9HG
E. Raymond Churchill	30th St., No. 609, Indianapolis, Ind.	9HH
Bert Von Wolff	2056 Buchanan St., Topeka, Kansas	9HI
Louis E. Hull	1207 Organ Ave., Fort Wayne, Indiana	9HJ
Frank Eugene Phillips	728 Bluff Blvd., Clinton, Iowa	9HK
Herschel Stults	Walnut St., Columbus Junction, Iowa	9HL
Cyril John Otterholm	993 Flandreau, St. Paul, Minn.	9HM

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RADIO CLUB OF HARTFORD

Mr. Walter B. Spencer, for several years president of the Radio Club of Hartford, is removing to New Haven to accept a position as principal of the new Commercial High School in that city, and has announced his intention of resigning the presidency of the Hartford club at its first autumn meeting. His removal will be a big loss to the Hartford society.

SEDALIA AMATEUR RADIO CLUB

The Sedalia Amateur Radio Club (Sedalia, Mo.) meets every Thursday night at 7:30 at the Y.M.C.A. The membership at present is small, but by fall we expect to have a life-size club. Even tho the membership is small, however, the bunch are live wires, and we have some very interesting talks on radio at the meetings, likewise some very heated arguments over various branches and details in wireless. Most of the club members have sets in working order, and the others contemplate having them soon. Anyone in this territory who is interested in radio is cordially invited to come in and look us over. For particulars in any detail see or write Mr. Otto S. McDaniell, President, or Mr. P. J. Handley, Secretary.

A NEW CANADIAN CLUB

Radio amateurs of Brantford, Ont., recently met at the Y.M.C.A. in that city to talk over the organization of a radio club to become affiliated with the A.R.R.L. and further relay communication. Mr. Keith Russell, manager of the Ontario Division, gave a very interesting talk on the work of the wireless telephone. Temporary officers were appointed as follows: President, Caleb Rose, 3AM; Vice-President, Chas. Colchester, 3CH; District Superintendent, W. K. Mitchell, 3BA. We wish them every success.—Canadian clubs will find interesting work in the establishment of relay routes between their stations and the U. S.

ESSEX COUNTY RADIO ASSN.

This club consists of a number of sections located in various cities within the county which gives it its name, with headquarters in Salem, and at their last meeting the Salem and Beverly members attended a meeting of the Lynn section at the Y.M.C.A. in the latter city. Guy R. Entwistle, New England Division Manager, spoke on traffic handling, and Mr. Claude P. Cairns, chief Acme engineer, gave an interesting talk on the new devices for C.W. transmitting. The Haverhill and Lawrence radio clubs were welcomed to admittance as units of the county club. The organization is rapidly growing and has its goal a membership comprising every amateur and club in the county. Their recent membership campaign resulted in 65 new members.

At the last July meeting the A.R.R.L. emblem was accepted as the official insignia of the Club, and the traffic rules of the A.R.R.L. were adopted for its regulation. It is planned to entertain the Lowell Radio Club as guests early in September, and to hold a radiophone dance for the entire county in October.

ROCHESTER RADIO CLUB

The Rochester Radio Club (N. Y.) recently held its election of officers, and has now adjourned for the summer, but planning big things for the fall. The officers elected were: President, Ralph Hairs, 8GI; Vice-President, Maurice Nelson, 8NB; Secretary, Geo. Batterson, Asst. Secretary, Russell Deane, 8PY.

OUR LESS EXPERIENCED BROTHERS

(Concluded from page 31)

and complete than an amateur radio broadcast on automobile thefts? Instead of having to telephone one at a time to a large number of police headquarters in nearby towns and cities, well organized amateur radio could broadcast over a tremendous area in a few moments at no expense. If our country brothers were also thoroughly in with us, they would offer a tremendous help in securing the information, especially where they are located upon trunk highways. We expect to see this develop in the future. In the meantime, let us all endeavor to co-operate with each other and avoid all of those things which are bound to follow in the wake of aristocracy and class distinction.

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Conducted by Guy R. Entwistle

THE TRANSFORMER

AFTER we have worn out a few sets of dry cells and lost our patience with a sticky vibrator, most of us look for relief in a transformer.

The best type, the proper size, and the amount of capacity to use with it, are problems to the beginner. The writer has heard this subject admirably analyzed by Mr. Claude F. Cairns, an expert on transformer design, and will try to give it to the readers of QST as closely to Mr. Cairns' ideas as possible.

We all know that the transformer is used to supply the high voltage necessary to charge the condenser before it can be discharged by the gap to produce wireless waves. Ordinary 110-volt A. C. forces a comparatively high current through the primary winding, creating a magnetic current or flux. This in turn cuts across the many turns of the secondary, inducing a very high voltage in it, the voltage of course being proportional to the **turns ratio,** which is the number of times as many turns the secondary has as the primary. If, for instance, the secondary has 100 times as many turns as the primary, then the turns-ratio is 100. Multiplying the primary voltage, 110, by 100 gives us 11,000 as the open-circuit voltage at the transformer secondary. See Fig. 14. This assumes, of

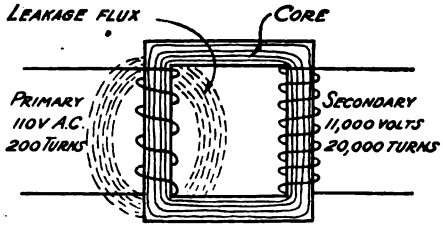


FIG. 14

course, that there has been no leakage of flux; that is, that all the flux lines created by the primary current have been conducted by the iron core over to the secondary turns. This is no place to discuss leakage flux and its effects, more than to say that it determines what the secondary voltage will be, and whether the transformer will be best suited for a rotary gap or a quenched gap, and in a way helps us to judge the probable best spark frequency to be used at the gap if it be a rotary.

There are in general two distinct types of wireless transformers, the resonant type and the non-resonant. The former has been with us for some time and includes practically all the popular makes on the market in pre-war days, while the latter is comparatively new in amateur circles. It is important that the reader understand the main point of difference between the two types. Let us depart from electricity for a few minutes and turn to mechanics for an illustration of our term "resonant" or "resonance." We all know that we can set up a violent motion or vibration in a slender plank stretched across the banks of a narrow stream. We do this by applying a **small force at the right time** over a **period of time.** The longer we keep it up the greater becomes the vibration, up to certain limits. This phenomenon is the very heart of the existence of wireless, in fact, but the thing we are most concerned with is that it takes **time** to **build up** a strong force if we are depending on the phenomena of resonance for it. When we think of a strong vibration built up in this manner we might also think of it as a **free** vibration. Now there is another way to set up a vibration in our plank. If we make it smaller for convenience, then we can take it in our hands and shake it at whatever rate of vibration we wish, slow or fast. The strength or force will depend upon our strength, but the most important point is that we don't have to time our successive applications of force nor do we set up free or natural vibrations, but rather **force** the plank to vibrate according to our will and practically no time is taken to build up such forces or vibrations. This is an example of our non-resonant phenomena. It remains for the reader only to pass back to our electrical apparatus and apply the facts just illustrated in mechanics. Referring to Fig. 15, for the resonant type it will be seen that it takes time for the secondary voltage to attain its maximum, while with the non-resonant type practically no time is taken as the secondary

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voltage reaches a maximum almost instantly. (The diagram has been exaggerated purposely.) An understanding of this feature is of great importance in selecting the proper speed for the rotary, so bear it in mind.

There is much dispute over the question of high and low gap speeds with their corresponding high and low **spark frequencies.** If our gap is set for 11,000 volts, from Fig. 15 it can be seen that if we have our rotary stud facing the stationary electrode at point B, for the resonant type, we will get no discharge, as the secondary **has not yet had time to build up.** In the case of the non-resonant type, a full discharge will occur. Not until point E does the resonant type produce a wave-train while during the same time the non-resonant type has produced several. In other words, we must be careful not to run the rotary too fast with one type of transformer, while the other type lends itself to higher spark frequencies. Now since the power put out by our entire set depends on the spark frequency, directly, if we can increase it and at the same time not destroy a balance elsewhere in our set we will increase our range. Most of us try to increase the spark frequency without a thought of what other changes we bring about. The best test is to watch the aerial ammeter when we make changes. It is a good guide in all adjustments except those affecting the coupling.

Another feature in the selection of a transformer is its power factor. We will not go into this further than saying that it is the relation between the actual watts taken by the primary and the apparent watts. The former is indicated by a wattmeter in the circuit, while the latter is computed by multiplying the voltage by the amperes drawn. The power factor is never greater than 1 (unity), and generally less. It is important for the amateur to maintain it as high as possible. The capacity used across the transformer secondary controls the power factor to a great extent. Hence the amateur should use the proper condenser as specified by the manufacturer if he would get the best out of his apparatus. A transformer is rated in kilowatts or a fraction of a thousand watts. This does not mean that we can draw 1000 watts from a 1K.W. transformer regardless of what we do with it, but it does mean that that much can be obtained under proper conditions. Progressive radio companies are sending out test tags on their apparatus telling just what values primary voltage, secondary capacity, and spark frequency to use, hence instructing the amateur how to use the apparatus properly.

Still another idea in connection with the various types of transformers. We all know that we want to get the most **power** in the antenna. This means we must get a maximum amount in the condenser circuit before it is passed over. Now our power formula says that the power increases with the square of the voltage. **Doubling** the voltage will give us **four** times the power, PROVIDED THAT IN DOUBLING THE VOLTAGE WE HAVE NOT DISTURBED THE OTHER FACTORS WHICH ALSO GOVERN THE POWER. This does not mean that best results will be obtained with transformers for which the highest secondary voltage is claimed, for the reason that transformers are rated in **open circuit** voltages on the secondary side, and as in the case of a storage battery, the open circuit or **no-load** voltage means nothing. In order to know what any type will do we must obtain **load voltages** with the condenser on and the key

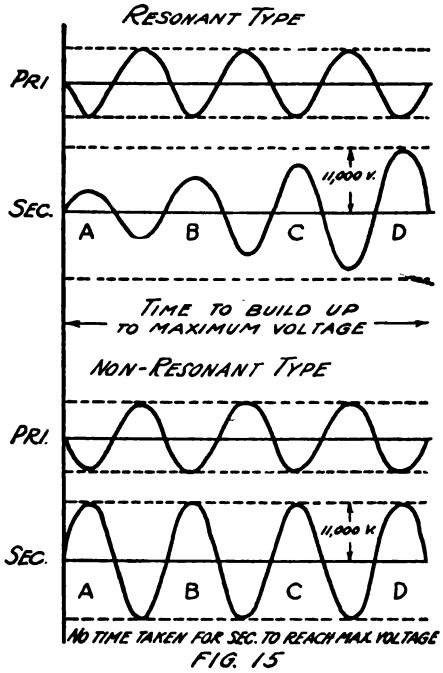


FIG. 15

pressed. Two popular makes of transformers were given this load test with results that were approximately as follows:

	No load	Load
Resonant type	13,000	7,000
Non-resonant type	11,000	9,000

These are not the exact figures, but serve to illustrate the point that under load conditions, which of course are the only ones to consider, the non-resonant type, in this particular case, was the best. Unfortunately the means for determining the secondary voltages of transformers under

(Concluded on page 44)

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Wireless vs. Women

Scenario by H. A. Perrill

Scenery by the same guy

(Apologies to K.C.B.)

Editor QST.
Dear Editor:—

I was over to see my girl
The other night
And I happened to think (no pause)
How many features in common
Are possessed
By those two unfathomable mysteries
Wireless and Women
Most women do their hair
In WAVES
Some LONG and some SHORT
And all of them
Wear SWITCHES
And when they turn
The BATTERIES of their eyes
Upon us,
The MAGNETISM in them
Draws us irresistibly
To their sides
And we often think
That we read a MESSAGE
In their depths
But when we try to COIL
Our arms about their waists
There is frequently
TOO MUCH RESISTANCE
And we find that we
Have mistaken the SIGNALS
But then again (sometimes)
They let you make
A SHORT CIRCUIT of their waists
Which might be called
A TIGHT COUPLING

They are the RECEIVERS
Of our affections
And they hold the KEYS
To our hearts
Unless they lose CONTROL

They are the TRANSFORMERS
Of our lives and destinies
And the RECTIFIERS
Of our mistakes
And my buddie
Who has been reading this
Over my shoulder, says
That they are also ALTERNATORS
But he is sore
Because his sweet patootie
Has stepped out for a date
With his rival
She's quite a high flier
So I call her an AERIAL
And I think she's making
A DUMMY of him
He says that he thinks that she
Is a CONDUCTOR of his kisses
(Which must be nice for the other fellow)
But he never can DETECTOR
Passing them along,
Because when she's alone
With the other fellow
He's never there



But to go on
With my story
Women are the GENERATORS
Of all our SPARKING
And the INTENSIFIERS
Of all our ALTERNATING CURRENTS
Of Love and Jealousy
And most of them
Have SOLENOIDS
(or maybe it's adenoids)

But anyway, I've got a date
So I'd better stop
And make a DASH for my DOT
Or I'll be too late
To METER

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Half of the QRM is unnecessarily-drawn out conversation. BE BRIEF!

An antenna loading inductance is almost unknown in amateur transmitters. Why? Every time the wave length of the aerial circuit is changed on a set with only an oscillation transformer, the coupling has to be carefully re-adjusted. A helix of a few turns would obviate this.

I'm Forever Losing Signals

(Tune: "I'm Forever Blowing Bubbles)
I'm forever losing signals,
Pretty signals in the air;
They're pitched so high,
Nearly reach the sky,
Then like my dreams they fade and die,
Signals always fading,
I've tuned everywhere.
I'm forever losing signals,
Pretty signals in the air.
—Written by Lose M. Ezzy.

8FN has a remedy for the decreased sigs which result when two pairs of phones are put in series in an audion circuit. He shunts them with a high resistance made from a strip of cardboard soaked in India ink, about 1½ inches long and ¼ inch wide, and says the sigs are increased about 75%.

The ordinary two-piece pull-apart plug used in lighting fixtures can be used in many places in constructing apparatus, to connect in phones, battery, etc. The plug part will firmly screw into a hole in a panel or cabinet.

How to Make Radio Fudge

Get several buckets and go out and pick all the little ohms off your antenna. With the aid of a shovel and several large wires and scoops, secure more ohms out of the ground. Dump these 5,890 ohms into a barrel with a few odd microfarads, add 30,000 volts, 20 amperes input, 7 sets of kickbacks, and stir well (for your own protection) with 1 A.R.R.L. Wouff Hong. Serve at 30 w.p.m.

The Benwood Company has reorganized and greatly enlarged its manufacturing facilities for the coming radio season. W. E. Woods, who has lately been the manager of the radio department of the Manhattan Electric Supply Co. of St. Louis, is the president of the new concern and is the owner of station 9LC. L. A. Benson, of station 9KV, is the secretary and production manager of the company. Both of these men have many radio friends thruout the country, and will be pleased to serve them in their new capacity as officers of The Benwood Company, Inc.

Seen on the screen at the local theatre. "Coming: 'Father on the War Path'". Must be the sequel to "Willie in search of switch contacts", or "The Missing Collar Buttons."

An Ode to Eddy

(Sung to the tune of "Mother")
E just stands for "Eddy", Mr. Warner,
D is for his never-ending day.
I is for his interest in things "hammy",
T is for the tubes he lays away (!?&%$#!)
O is for the "orful" words he uses,
R is reading letters he enjoys;
Put them all together they spell EDDY—
The Eddies are the grand ol' boys!
6BUNK.

How do you like the cartoons by Hoffman? We'll have one every month for a while.

And what do you think about the illustrations and descriptions of interesting old obsolete stations? Are they sufficiently interesting to take up a whole page in our QST?

The owner of Canadian 3DS, Kitchener, Ontario, notes on page 41 of July QST that he was heard by 1TS, Bristol, Conn. At this time a Ford coil running from a 50-watt step-down transformer was being used. Rather a phenomenal range, he says, and wonders why they can't hear him on the same transmitter at Brantford, 30 miles away.

Just saw a sign in a hardware store in Boston: "Agents for Johnson's Underground Garbage Receiver." Howzat? Eh! Talk about underground wireless; just out, and got it beat already. How does this smell to you?

The law requires that all stations testing shall frequently sign their call letters.

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The particular attention of radiophone operators, who are not in the custom of indicating their identity at all, is asked to this regulation.

Young & McCombs, Rock Island, Ills., announce that about Sept. 1st they will have a new C.W. transmitter in operation at 9BY, with a power of 550 watts, and will give radiophone concerts every Thursday evening, 7:15 to 9 o'clock, with a fifteen minute intermission at 8 p.m. for 9ZS' time signals and weather report. The latest phonograph music will be played on amateur wave lengths, and a report of their signals will be appreciated. They also operate station 9BC, using a deForest radiophone with eight bulbs, operating regularly over 200 miles.

The Navy Department is testing a new device to steer ships into New York harbor in heavy weather. It consists of a 16-mile cable laid on the harbor bottom from Fort Lafayette out to the Ambrose Channel light-ship. On foggy days a 500-cycle current will be sent thru this cable, and ships will be equipped with loops slung on either side near the bow, the loops connected thru amplifiers to a headset, to pick up the signal by induction. It is expected that vessels, guided to the Ambrose light-ship by the radio compass stations in the vicinity, will pick up the 500-cycle note, and that by the intensity of the sound the operator can guide his ship to a position directly over the cable, then by keeping the sound in each ear equalized, he can safely guide it up the channel to the end of the cable.

WOULDN'T IT BE WONDERFUL—

If after QRA-ing all evening you should find you had been working a moth! (See page 7, Radio News for July.)

If the typewriter you bought to copy MSGS with would make a few shades less noise than a boiler factory?

Wouldn't it, if you could break NAH and say, "QRT pse, half hour."?

If 7DA would throw away that side-swiper, and if 7EY should learn the code?

If Bell telephones had 2000-ohm receivers on them, instead of 75's?

If you didn't have to get out of bed when a thunder storm came up, and sit in the parlor until it passed, for fear of it coming down the aerial and jumping to your feet which stick out of the foot of the bed just far enough to reach to the lead-in where it connects to the loose-coupler?

If certain stations, mentioning no names, were detected, regenerated, and amplified?

If every second ham didn't ask you where that new station is that signs MO?

Two unfortunate mistakes have occured in recent lists of "Calls Heard", where portions of a list have appeared without proper heading. On page 46 of July QST, right hand column, top, the calls listed belong to 9ZL, Manitowoc. Right hand column, top, of page 55, August number, belongs to 9ZT, Minneapolis. Sorry, fellows.

MR. MAXIM DELIVERS AN ADDRESS BY RADIOPHONE

On July 3d, while on the West Coast, our President, Mr. H. P. Maxim, thru the courtesy of Lee deForest, Inc., was enabled to address the wireless world of the western United States over their 1 KW Radiophone at the California Theatre, San Francisco.

Lack of space prevents reproducing Mr. Maxim's talk in full. He called attention to the marvelous strides being made in radio development, the unlimited possibilities of the future, and the great potentialities of a national organization of citizen radio station owners—our own A.R.R.L. In closing, he extended his compliments to the amateurs of California and expressed the hope that we of the east will soon be able to communicate direct with those of the great west through the air.

On June 23d, Lieut. Ellery W. Stone, U.S.N.R.F., delivered a lecture on vacuum tube theory and practical operation, by the same means. The talk was both interesting and instructive, and altho believed to be the first occasion where a technical lecture was delivered by radiophone, its success augurs well for an extended use of this possibility of the phone.

THE JUNIOR OPERATOR

(Concluded from page 41.)

load are not available to the average amateur.

This column is not for the purpose of giving free advertising to the apparatus of any maker. The reader is asked to give his own particular apparatus a fair trial under proper conditions. Countless amateurs have come to the writer with a tale of woe about this or that, only to find that they didn't know how to use the apparatus they had properly. We are all in the game to learn, and it is no crime to make mistakes. When the quenched gap made its appearance it was condemned by many who had had no experience with quenched spark tuning, and not until much educational literature was sent out and personal attention given by the manufacturers did the amateur learn of its advantages.

Are you working YOUR APPARATUS to its full capacity?

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CRITICISM OF "PROF. BUGS'" LETTER

Washington, D. C.,
August 9, 1920.

Editor, QST:

I have noticed a letter on page 49 of the August QST signed "Prof. Bugs" in which several errors occur. The writer first makes use of a well known formula for the radiation resistance of an antenna. This formula is at best only a rough approximation, as few antennas approach the theoretical cases. The height H expressed in the equation is not the actual height of the horizontal part of the antenna, as "Prof. Bugs" has used it, but is the **effective height** of the antenna. This may be considerably less than the actual height if the antenna is not located over a good conductor, such as water, and varies slightly with the wave length. As a matter of fact the value given, 16 ohms, is much too high for the radiation resistance of the average antenna.

On reading farther I was much surprised to see that "Prof. Bugs" was about to explain an experimental method for determining radiation resistance but was disappointed to find that he had described a familiar method for measuring, not the **radiation resistance,** but the total **effective resistance.** This effective resistance is made up of several components, one of which is the radiation resistance, the others of most importance being the resistance of the conductors of the antenna and the resistance due to dielectric losses in the field of the antenna. For further discussion on this subject and also a complete description of methods of making resistance measurements, the reader is referred to Circular 74 of the Bureau of Standards.

"Prof. Bugs'" scheme for using the D.C. value of resistance in the substitution is unsafe unless the resistance is absolutely non-inductive and of such large surface that the skin-effect is slight in its effect on the high-frequency value of resistance. Very few resistances approach these requirements at wave lengths as low as 200 meters.

Under good conditions the effective resistance of an antenna for amateur use may be as low as five ohms, while 8 or 10 ohms is not too high for very good work. If the lower value, 5 ohms, is taken it is readily seen that with an antenna input of 500 watts an antenna current of 10 amperes would be obtained. Of course 50 per cent. efficiency is an exceptionally high value but with a 1K.W. set and even 30 per cent. efficiency 6 amperes would be obtained if the antenna resistance were the only determining factor.

The real answer to the question of low antenna currents is in most cases not too high antenna resistance but too small condenser. This has been explained several times before in the columns of QST and need not be considered in detail here. The difficulty is met, of course, in trying to obtain a capacity large enough so that the 200 meter limit will not be exceeded.

As further proof I will cite two examples of actual transmitting stations. One used an input of 250 watts to the primary of the transformer and an antenna current of 3 amperes was obtained. The other was a 900 cycle synchronous gap set operating at 175 meters. The transformer input was 125 watts and the antenna current 2 amperes. The antenna was a T, forty-five feet long and forty feet high.

It will be noticed that both of these stations were of much lower power than 1K.W. and so could use a condenser of sufficient size to handle the power. If a 1K.W. set could be operated under conditions as favorable, antenna currents of 10 or 12 amperes would be common.

In closing I might remark that anyone who will discover a quick and accurate method of measuring the radiation resistance of an antenna will win a sure place in the "Hall of Fame" of radio telegraphy.

Very truly yours,
John C. Warner.

IRON ORE AND INDUCTION

Ishpeming, Mich.,
July 14, 1920.

Editor, QST:

Right off the bat, let me say that I am not attempting any sort of a clever letter, for publication. "I'm a Ham."

Am glad to say that I have fallen into a great big class of amateurs who wait patiently for "QST", and then absorb every word in it from cover to cover. One reason I like the blooming magazine is because it seems to have personality, sort of makes one feel as though he knew all the bunch. It has made me feel as though the

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Editor is almost human and perhaps would like to hear from a part of the U. S. that most people think is as yet uncivilized, and is, as far as "Radio" is concerned.

I wish "The Old Man" would come up here with his Maltese pet, and turn loose some of his energies, in showing us birds how to get out of our difficulties. These difficulties have discouraged most of the "bugs" except two or three here, and a few in Marquette.

We are situated in the heart of the iron country. The fact that there are large deposits of magnetic ore in spots doesn't bother us as much as does the fact that the power used in most of the mines is electrical.

Here's what an amateur runs into in the erection of an aerial. Hills, all kinds of them. A nice big vertical hill about fifty feet from his lead-in, and where he wanted his greatest directional effect. This causes him to disregard directional effects, or disregard radio rules and regulations, because of the lack of radio inspectors in this part of the country, and take a thousand foot stretch to the top of the hill. When he does, he finds he is parallel to a transmission line carrying anything from 2200 V. to six wires carrying 33,000 V. If he still has some "pep" and swings his aerial some more, he is parallel with a "hay-wire street car line" whose rail binders are so poor that in the winter the snow is melted around the rail ends. In my case, the street car line turns the corner and I can't get an aerial at right angles to the line, going or coming. I can hear all the works in the Power House as well as all the cars every time they start or stop, for a mile in either direction. Perhaps "The Old Man" could devise a way of picking up some of the stray juice and using it for his C.W. set. There is enough of it for C.W. sets for all the amateurs we can educate up here.

A "Roger's Underground" is hopeless without tons of dynamite and some steam-shovels. There remains the loop. I have tried about all the loops I ever heard or read of, and a lot more. I could use most of them to tell where the street cars were or to tell how many times an hour the skips went up or down any of the mines. Sometimes after mid-night, when the cars have stopped running, and all the skips are down or up, or being repaired, by using all the audions I have, as well as a lot of imagination, I can hear NFF, NAA, or some other high power cuss, for almost five minutes at a time.

What I want to know is—are we the only ducks in the world in this fix, or is it due to our ignorance? In all the magazines, we read about no end of hook-ups, C.W. Transmitters, etc., but aerials and how to dodge induction, seem to have been forgotten. Or do the Editors take it for granted that there is no one so ignorant as not to have solved the problem?

I had the same difficulty five years ago and gave up radio as being too deep. While in the army I was again bitten by the bug. I learned everything there was to know about radio in France, absolutely. I could have talked with Mr. Marconi himself. Was put in charge of Regimental Radio Communications, and then Brigade Communications for an Artillery Unit, then sent to a F.A. School of Instruction in charge of Radio instruction. Oh, what wonders I was going to do up here when I got back. Wow! But I sure have gotten some bumps. With the same set and a similar aerial as I used in France and used to get YN, POZ, BYZ, FL, and now and then the U. S., etc., etc., I couldn't, and can't, get a blooming thing. In the discard with the cute little French audions, for something that would oscillate, plus much work; result, after waiting half an hour or so most any time by adjusting about "steen" knobs, handles, switches, etc., of half a dozen balanced unstabled circuits, I can hear one or two of the big C.W. Stations on about 16,000 wave length.

Transmission? Fine. Given a couple 1K.W. transformers, a warehouse full of condensers, insulators, wire, etc. After giving the stuff the once-over, you decide it's good for an easy two hundred miles in hilly country. When asked to hook up two stations fifteen miles apart, with them, you think it's a pipe. You just kinda hook 'em up careless-like, to show how easy it is, get an old navy man on the other end, and listen, and sweat, and listen some more, with nary a peep except the skips going down and up. About then, you get mad, take a week off, and do the job right with no results, about then you are glad you didn't talk with Mr. Marconi. Then when you pile one station in a car and take it about fifty miles in the opposite direction and it works fine any old way, you kinda decide you don't know nothing.

Am sorry, Mr. Editor, that I raved on to such a length. If by chance you do waste your valuable time in reading all of this, I apologize for imposing upon your good will. I don't often get a spell like this, but I just gotta know if QST or anyone else can help us out. The other hams won't display their ignorance, so I must.

Again hoping that I have not imposed too greatly upon your valuable time, I am

Very truly yours,
H. C. Jarvis.

(This is not an easy problem—induction troubles and an ore-laden country to work over. But some amateurs in that territory are getting good results, and we are sure Mr. Jarvis would be grateful if they would

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write him and tell how they overcame similar difficulties.—Editor).

SIMPLE, ISN'T IT?

Eddie Varner—

Static he come in my telephone receiver box very strong. Him with the signals interfere do. This worry considerable, yust like you take eraser n rub oudt what transmitter man speak.

Today I fine good reliable way eliminate this static. Very simple indeed. Funny to me no one think before of it. Turn Audion Bulb oudt and no more static. This is so because

$$2' \times \frac{96\%}{W\,L} \times \sim = \text{No Static.}$$

1 CRAB.

INCREASING ANTENNA CURRENT

6518 Kimbark Avenue, Chicago.

Editor, QST:

Just received July QST, and have already read it from cover to cover. Makes me sick to think I have to wait a month for the next one. On reading it over the second time I decided to "Write Something." I think that the average amateur who hopes to be a DX or LD man and is not as yet, would be interested in hearing of my efforts to increase my radiation.

To start with, I had beside the transmitting set, an ammeter to measure radiation, and an "Amrad" wave meter. Every fellow who has not these two instruments should either buy, beg, borrow, steal, or make them, for without them he is next to helpless. I had an aerial of three wires, about eighty-five feet long, and about sixty feet high. My ground was hooked on to the radiator, the water and the gas pipes, and as I live in Chicago, I thought that the city water works, gas stations, etc., ought to have enough capacity to take care of a wireless set. Of course I had heard Doc Radio and others rave about burying everything you have, even your loose change, and intended to do that sometime. As I was using a straight gap with the set, which consisted of a ¼ K.W. transformer which drew ¾, bad glass plate condenser, O.T., straight gap, and, of course key, I decided that the thing that would boost my radiation most was a good gap. Thereupon I bought me the best I could get, a Hyrad. With the plain gap I radiated two and a half amperes. With the Hyrad, my radiation increased to three. Right then and there I decided that it cost money to increase radiation. That half ampere cost me just thirty cold hard dollars. At that rate it would cost me a small fortune to put seven or eight amperes into the aerial. But the desire was strong, so I kept at it. I have heard "Doc Radio" rave about having a mob of wires in your aerial, and having them short, not over 125 feet from ground to far end. I had also seen Mr. West's article advising a small aerial just big enough not to brush. I had noted that most of the DX stations that I knew of had plenty of wires in the aerial. Therefore, forgetting old 8AEZ's records I put up an aerial 70 feet high at one end, 60 feet high at lead-in end, having nine wires. At the high end it is supported on a 36 foot spreader, and at the lead-in end on an 18-foot spreader. The aerial proper was 80 feet long. The lead-in consists of number 4 wire and goes directly to the set, which is on the second floor. The wires to the ground were short and heavy. I expected great results, but was disappointed to find that my radiation dropped to one and a half amperes, or nearer one with proper coupling. The set was tuned OK too. I therefore traded my quarter K.W. and ten bucks for a 1K.W. Transformer. Radiation now was two amperes. I began to get disgusted. Who were these liars that radiated 7 and 8 amperes, anyway? I got some first class condenser, the kind old 9BR used, and found my radiation to be 2¼ amperes. Well, I had a good aerial, a fair transformer, a good condenser, a good gap, and a good O.T. I began to worry about power transformer resonance, and almost got excited enough to buy a Thordarson "thunder factory." Instead, the family got excited about my own little "thunder factory", so I sold my Hyrad, resolving to get a quenched gap. With the money in my pocket I got reckless, went to a hardware store and put $7.50 into 50 feet of chicken netting. This I cut into two pieces and laid them down in the back yard, not taking time to bury them. I ran seven number 14 wires to the operating room, almost directly above, hooked my new ground onto my old one, pressed the key, and then did a Highland Fling. Oh boy, Ain't it a grand and glorious feeling? 7½ amperes with a straight gap, and on two hundred and four meters. When I put in my Quenched Gap, put more wire in the aerial, bury that chicken wire and put some more on top of the ground, I think she ought to come up a couple more. As I am operating on a ship here on the Great Lakes and only get home for a short time, and always in the day time, I don't know how far I can work. I have been able to work everyone I can hear and have not yet been reported except as "QSA very." by all those. I use a Paragon RA6 regenerative set and a one step amplifier. Am expecting to put in another step of amplification and complete the transmitting set before next winter, and hope to get into the relay game then.

(Continued on page 52)

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TUSKA "C.W.

Licensed under Armstrong U. S. Patent No. 1,11

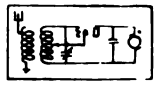
AMATEUR "C.W." is here to stay. We have been designing and planning C.W. apparatus for several months. The results are shown below. Every piece of equipment is the result of the writer's own effort to establish a C.W. Transmitter. Each inductance is a painstaking development of laboratory measurement together with actual practical use. The same will be found true of every piece of apparatus we recommend.

You cannot go wrong in buying TUSKA "C.W." EQUIPMENT. The design particular circuit for which it best and mechanical construc assure you of satisfaction.

Take for example the wound with the correct numb on a correctly proportioned not merely wound. The le turn at a time. The arrang

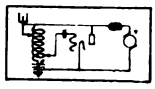
TUSKA C.W. INDUCTANCE—Type 182. This inductance is designed for the electro-magnetic circuit shown. The aerial and filament connections are variable by means of a positive contact switch lever. The winding is threaded in Bakelite tube 3¾" in diameter by 7¼" high. Hard rubber panel 4¾" x 7¼". Wave length range 200 to 325 meters. Shipping weight 2 lbs.





Price - - $10.00

TUSKA C.W. INDUCTANCE--Type 181.



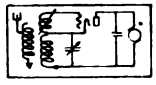
The correct coil for the capacity feed-back circuit. We recommend this circuit strongly; simple and effective. The inductance has one winding, two switches, and four binding posts. Our design makes it easy to operate. Bakelite tube 3¾" by 6" high. Hard rubber panel 3½" x 6". Wave length range 200 to 325 meters. Shipping weight 2 lbs.



Price - - $7.50

TUSKA C.W. INDUCTANCE—Type 183. Some experimenters prefer the grid tickler type of feedback. Our inductance Type 183 is designed for this kind of circuit. The grid coil is wound on a small Bakelite form which rotates inside the plate coil. A knob on the panel controls the coupling between grid and plate. Tube size 3¾" x 7¼". Panel 4¾" x 7¼". Wave length range, 200 to 325 meters. Shipping weight 2 lbs.





Price - - $12.50

METERS Without me mitter are are essential, and correct rea be used. We recommend th The ones listed below are re one, two or three 5-watt tub application Delivery on We



Weston Mod reading plat volts complet plier. The meter. Flus **Price**

Weston M A plate type. 0 Flush mo **Price**



Weston Mod meter insure current. 0 mounting. **Price**

G. R. Ho tube trans antenna had in the ing as sh 0 to 1 amp **Price**

THE C. D. T

T

ATLANTIC RADIO COMPA

A. P. MERCHANT COMPA

GEO. S. SAUNDERS & COM 11

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EQUIPMENT

4 and U. S. Patent Application Serial No. 807,388.

uctance is based on the With materials of the very th and simplicity, we can

our inductances; each is the right size copper wire,

The tube is threaded— tive contact with a single binding posts and knobs is

O

tments of a C.W. Trans- f not impossible. Meters the only sort which should ers. They are accurate. transmitters consisting of upply other ranges upon k weeks.

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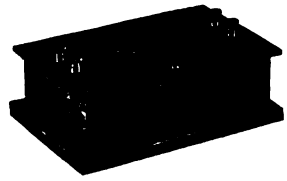
one of planned convenience. Careful insulation takes care of the high potentials. We are proud of the over-all efficiency.

Your Dealer will have TUSKA "C.W." EQUIPMENT in stock. If he hasn't, send us his name, and we will mail you our booklet on AMATEUR C.W. TRANSMITTERS.

C. D. Tuska *President.*

FILTERS

If a motor generator is used for C.W. or telephone work, a disagreeable hum is experienced from the commutator of the high voltage generator. By means of condensers and inductances, this hum may be made a minimum or entirely eliminated. The Tuska Filter Type 170 consists of two 1 mfd. condensers and two iron core chokes, correctly made and wired. Guaranteed for a potential of 750 volts. Mounted in a wood case 5" x 7½" x2½" with hard rubber panel as illustrated. Shipping weight, 3 pounds.



TUSKA FILTER TYPE 170
Price - - $16.00

MISCELLANEOUS

Following our policy to specialize in C.W. transmitters, we have added a complete line of standard accessories for this work. These accessories are products well known to the trade. Up to this time, it has been impossible to purchase the various units needed at one place. We are in a position to supply all of your needs from our stock.

Sockets — **Chokes**
Transformers — **Rheostats**
Condensers — **Motor Generators**

Parts of all types

COMPANY :-: HARTFORD, CONN.

s Carry TUSKA "C.W." ACCESSORIES In Stock.

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BENWOOD

LET'S GO, FELLOWS—

ANNOUNCEMENT

We take great pleasure in announcing that the BENWOOD SPECIALTY CO. has been reorganized and will henceforth be known as THE BENWOOD CO., Inc., manufacturers and distributors of radio apparatus.

Due to our rapidly increasing business it has become necessary that we move to larger quarters where we will have greatly enlarged manufacturing facilities and where we will carry in stock at all times a comprehensive line of all standard radio apparatus and material.

It will be our policy to ship all orders the day received and in the rare cases where this cannot be done we will notify the customer of the fact and state when shipment can be made, thus assuring you that the order has received the attention it deserves.

We are well aware of the fact that when a radio man orders something **he wants it and wants it quick,** therefore our watch word is SERVICE and you can prove this assertion by giving us a trial for **anything** pertaining to radio apparatus or material. Our central location makes it possible for us to give you the utmost in promptness and owing to the fact that we are the largest distributors of wireless apparatus in the midwest we respectfully request that you favor us with your business.

The "Benwood" Rotary Quenched Spark G

4 AMPS. ON ½ K.W. GOOD FOR 1000 MILES.

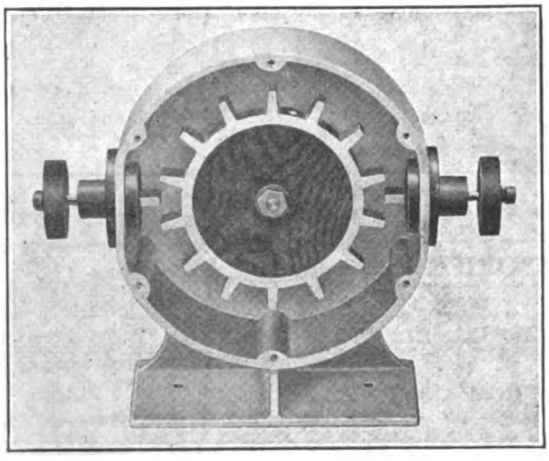
THE ULTIMATE SPARK GAP for the AMATEUR STATION.

Quiet and Efficient.

Cannot be heard outside of the room in which it is operated.

Absolutely airtight, practically noiseless, **increases radiation,** gives a beautiful clear n Your transmitting set can now be operated anywhere in the house with none of the familiar noise. Designed for powers up to and including 1 K.W. Works equally well any make transformer.

A NEW GAP FREE IF INSULATION BREAKS DOWN.



Benwood Gap—Open
OLD STYLE DISC SHOWN.

Bakelite Insulation Throughou

Absolutely Guaranteed Against Elect Breakdown.

The disc housing is a highly polished alum casting. Heavy busbar copper used for stati electrodes. The disc is a one piece casting s balanced.

The aluminum disc in conjunction with copper electrodes gives a beautiful quen effect with which all experienced operator familiar.

Shaft is of best tool steel turning in a l bearing 3 inches in length.

The BENWOOD gap is now being used by of the leading amateurs of the country. St which you hear every evening, such as, 1GZ 8ER, 8BZ, 6AS, 5ZA, 9ZJ, 9ZV, 9ZL, 9KV, 9HW, 9CA, 9IX, 9ET, 9JA, 9LR, 8DV, 9QJ, 9HN, 9DK, 9BG, 9HT, 9SC, 1AK, 5YH, 9AE many others too numerous to mention.

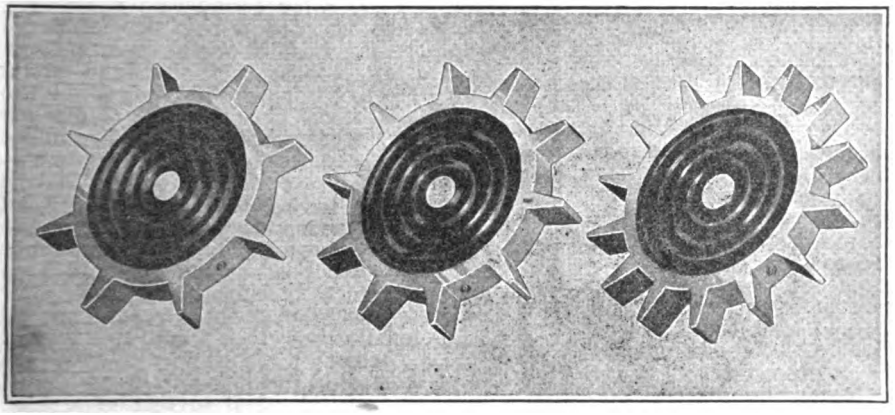
Price equipped with 4, 8, 10 or point rotor - - $3

THE BENWOOD CO., INC.

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APPARATUS

ISTANCE'' HAS STARTED AGAIN



DO SOME REAL DISTANCE

The "Benwood" Rotary Discs

SOMETHING ENTIRELY NEW

A real disc suitable for any 1 K.W. installation.

ıde in styles shown, with 4, 8, 10 and 14 points or
complete with bushing to fit any size motor

scs are of solid cast aluminum combined with
the right amount of zinc to give them the re-
d hardness. Solid black fibre center.
ed in conjunction with the BENWOOD stationary
rodes, which are of heavy bus-bar copper, a
tiful clear soft note is obtained due to the ex-
ıt quenching qualities of the two metals combined.
e disc is light enough for the smallest motor
yet has sufficient sparking surface for the higher
powers. The tapered sparking points give the quick break that is so much desired and give the disc a business-like appearance.

The discs are as beautiful as the illustration shows and they are an article of which we are justly proud.

Price complete, $8.00

Specify size of motor shaft.

BENWOOD STATIONARY ELECTRODES, consisting of knob, bus-bar copper sparking point, with round copper shaft but minus support,

75 cts. each, prepaid.

The "Benwood" Battery Charger

A MAGNETIC TRANSFORMER TYPE RECTIFIER.

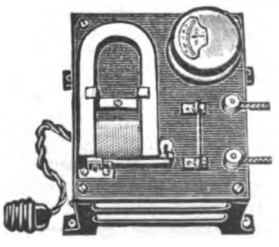
Designed for 4 and 6 volt Storage Batteries.

CHARGES BATTERY OVERNIGHT.

Constructed to operate direct on 110 volt 60 cycle lighting circuit. No external controls are necessary.
ly screw plug that is furnished with charger into the most convenient lamp socket and connect to the
ry.

A Necessity for any Wireless Station.

The BENWOOD battery charger is already used by many radio men and
pecially desirable where more than one audion bulb is used, as no battery
long stand up under the strain that three or four bulbs impose upon it.



PAYS FOR ITSELF IN ONE SEASON.

The average cost of charging the ordinary 6 volt 60 ampere hour battery
ty cents, and the results are often very disappointing. Using the BEN-
)D battery charger the cost for six hours use is approximately only ten
, therefore it is very evident that the rectifier will more than pay for
in less than a season.

e Complete with cord and plug and instruction sheet, $23.00

or. 13th & Olive Sts., St. Louis, Mo.

DEALERS, WRITE FOR INFORMATION.

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COMMUNICATIONS

(Continued from page 47)

Yours truly,
Harold Haerle Leighton.
Senior Operator S. S. Manitou, WFW, and 9LM, Chicago.

A LETTER FROM FRANCE.

Nice, Jan. 22nd, 1920.

Oh! you, our American comrades who will read these lines, you don't know how fortunate you are!

For several years before the war I have been a radio amateur. I used to read in American magazines about your doings, how you could build and use transmitting sets, how you were organized into a number of clubs and how, through a chain of amateur stations, you sent messages all the way across the continent, and all that under official encouragement!

Here it was just the contrary. According to law licenses could be obtained from the Government to erect "experimental" stations but, in fact, they never were granted except to a half dozen companies who were building radio apparatus on a commercial scale.

As for receiving it was different. The Government and especially the administration of Posts and Telegraphs did not like us to do it but they could not prevent us, there being no law to that effect. But just before the war, towards the middle of 1914, they spoke of passing such a law, then the war broke out and all receiving stations were dismantled and the apparatus confiscated by the Government.

Now that the war is over the decree forbiding the use of receiving stations is no longer in force, our apparatus has been returned to us and we operate once more under the pre-war law.

But the aspect of the amateur question in France is very different from what it was in 1914. Then the number of people having receiving sets was comparatively very small. They were mostly clock builders who needed the time signals, a few men who had served as radio operators in the merchant marine, in the Army or in the Navy and who were still interested in the art, and a few electrical students who had taken a special interest in radio.

Now, thousands of young men have learnt and practiced radio in the Army and Navy during the war and a majority of them is anxious to continue to practice what has been their daily work and main interest during five years. So, numerous radio sets are being installed all over France and it is to be hoped and supposed that the French amateur world will be ever increasing in importance.

Is there any prospect of a new law concerning us and if so what will it be? Such is the question on which all of us are anxiously speculating. It is hard at present to answer that question, but the author thinks it very unlikely that reception shall ever be forbidden. Everybody knows how harmless it is in time of peace and how impossible it would be to enforce such a law, a decision of that kind would only be a prejudice to the law-abiding citizen while any person willing to disobey the Government order could easily do so.

As for transmission there is unfortunately very little reason to be optimistic, the Government having the monopoly of all telegraphic communications in France no commercial company can use its influence to obtain authorisations which would be a good "precedent" for amateur to base their requests on. The author recently asked their opinions on this point to several French personalities connected with the radio world and their answers were almost in every case identical to that of a high rank army officer who said that if any kind of sending sets was allowed it would very likely be only bulb transmitters working at low power on very short waves and sharp tuning, in order to insure a minimum of chances of interferences with Government stations.

Let us hope that this at least may soon be allowed and that we too, like our American friends, can enjoy the pleasures of talking to each other through the medium of the ether waves!

H. T. S.

SPRINGFIELD HEARD FROM

Springfield, Mass.,
August 1, 1920.

Editor, QST:

We are not dead in Springfield, Mass. It seems to us that we have heard just about enuf of "there is no road thru Springfield."

Springfield is on the map. It has the best radio association in Western Mass. The Springfield Radio Association has its own home at 19 Orleans Street, Aerial 45' high and 75' long. The receiving set is under construction by members of the association, and a 1K.W. transmitter is expected this fall.

The membership is 22 and more is expected after the vacation season. The affairs of the association are conducted by a Board of Directors who have directed the installation of the aerial system. All work is done by committees with the chairman responsible.

You may expect this early fall to hear from Springfield, Mass., and also can work relay to any point within the limits of a 1K. W.

So, Relayists just keep the diaphragms

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of your 2000 ohmers close to your ears, for Springfield Hertzian impulses.

We will make an official announcement of our station at a later date.

Springfield Radio Association,
19 Orleans Street,
Springfield, Mass.

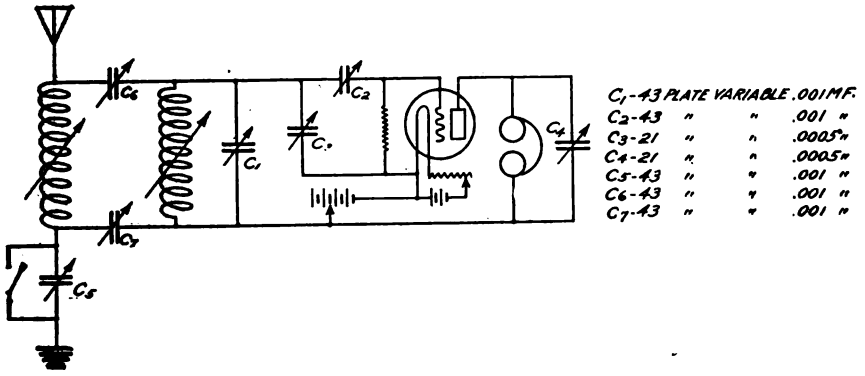
A STATIC-COUPLED CIRCUIT

685 So. Greenwood,
Kankakee, Ill.,

Editor, QST:

In the last few months I have been experimenting with receiving hook-ups and at last I believe I have found the best solution for a receiver of both damped and undamped waves.

I use a statically coupled receiver and I think they are the best from an amateur's standpoint, they are the easiest to tune; tuning done almost entirely by variables.



Using this hook-up in connection with a 5000 meter loose coupler and an audiotron bulb I have heard practically all the undamped stations; some of which are: IDO, NSS, NAJ, NAA, POZ, NAR, NBA, NDD, NAW, NWW, NPG, OUI, MFT.

I have had much success in receiving damped waves from many of the U. S. stations.

For tuning undamped waves C_6 and C_7 are adjusted at 180°; the variable in series with the ground, C_5, is shorted; C_1 and C_2 set at 90°, and C_3 and C_4 are varied by experiment.

For damped work, tuning is accomplished by C_6, C_7, C_1 and C_2. C_3 and C_4 are set at zero. The series variable, C_5, is also used.

I have had very good results using this hook-up, which I think is original, as I have not seen any others similiar to it.

I would be glad to help and give imformation to any amateur wishing to try out this hook-up.

Yours truly,
M. L. Potter, Jr.

MOO!

403 Decatur Street,
Brooklyn, New York,
June 29th, 1920.

Editor QST.,
A.R.R.L., Hartford, Conn.,

Respected Sir,

Have been feeling the impulse to write you for some time, but being a charitable soul, have put it off as long as possible, after seeing such little items as, "SOS de KBW", etc. But an item in "Strays" in QST for June, 1920, did it. You can blame yourself. You ask who the joker is that suggested MO for a QTE signal. I was present when the awful event occurred. It was a bright sunny afternoon in the summer of 1918 on the sixth floor of 44 Whitehall Street, New York City. 9PF, 2CS, 2MR, DA and many others know the place. The old control station for the various NAHs. Small loops had just been installed at City College, New York, and at Bush Terminal, Brooklyn. The war is over now, so it's OK to disclose such highly important military information. We were instructed to try to get bearings on some ship in range. Lieutenant M. W. Arps, O-in-C of Navy Radio, New York, at the time, was there when we raised a ship that both BU and CY said they could hear, so we told the ship to send for a bearing. He asked the operator on 600 meter watch (POP Atwater—I being on 952) what to send, and Pop referred the query to Mr. Arps. After a minute's thought, Mr. Arps said, "Tell him to send MO". There you have it. We gave several other ships bearings that day, and when we eventually got five regular-guy compasses working, the MO stuck, and was apparently adopted, at least unofficially all along the coast. The canucks use the figure 2, than which nothing is prettier when MRA rattles off 2s on his 300 cycle spark. English and French use INTL. MO is kinda tuff when it busts up your traffic with NBD at 1700 miles, but it's necessarily of more importance. If the

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second mate on the Princess Anne had asked his op. to get a QTE from NAH he would have been looking for Ambrose instead of trying to climb over Rockaway Point. She's an awful looking derelict now.

Another point which calls for comment is the item, (Also in Strays) on the Shipboard 2KW Arcs. A pal of mine is on the Eastern Planet, a Jap built craft, which is one of the Federal equipped ships. They get 3½ amps. on "J" with a chopper and can get fair distance if heard, but he complains it's so darn sharp he has to shift a turn at a time until he crosses their tune to raise the coast stations. Their working wave is to be 2250, and shore stations are to listen for calls on the wave during the last quarter of each hour. He ses he gets 'em once or twice a day on schedule. He worked VAL from Delaware. Breakwater on 2250, which is not so bad for daylight. VAL by the way, for general information is Barrington Passage, N. S., an undamped station of Canadian Marconi, which was recently installed to work the British ships similarly fixed. All work is on 2000. MGA, MHC, MBC, MRA and MLC all have 3 KW tube sets. Aberdeen, Scotland, is worked on the other side. I recently heard MBC (Baltic) report to WCG sailing and took a few from WCG. He then gave him a QRU. I smelled a rat, because the big Limies always have some "Good-bye" tfc when outbound, so I chased myself up to 2000 and there he was, giving New York City stuff to VAL. WCG was using crystal at the time, (now?) and couldn't hear him, though I foned the info. Think the Convention will prohibit such work, it being provided that "ships in range of station in one country, may not work beyond that station into another country unless ship is under other countries flag, and traffic is destined to second country, and work is carried on above 1600," or words to that effect. Have since heard MGA work NBD on the long wave, NBD using 1900 meter spark, and clearing traffic, what I mean, so I guess they will be good about it. All the sets installed at present are of different construction, as I understand, purpose being to find out which sets give best service, as Cunard contract with English Marconi runs out shortly, and all hands are competing for renewal. The tube sets are said to be too much in the experimental stage as yet to turn over to the average operator.

Now for a kick. The Old Man, in several of his recent ravings, has been hitting the "squeak boxes" as many raps as possible. I have always been limited to a 2 inch coil, due to impossibility of getting juice in here, but if I don't use better operating diplomacy than nine-tenths of the 1 KW QRM hounds I hear, I'll close up and get a job on the street cars. Many others in my position will agree with me. One bird here, well-known to all N. Y. C. hams, has a practice of calling ten or twelve spark coils, (like WCG calling traffic) and telling them, in not so choice language, to shut up while HE works. I haven't had the chance of getting him right on the profane language stuff, but some time, I'm gonna have another op here so we can corroborate each other and shoot his line in to Mr. Krum. 'Stoo much of that. Please ask the Old Man where the relay tfc would get to if the spark coil hams didn't do the dirty work of running around the block to deliver the stuff. And often getting a call-down because the message was a week coming through. And another thing, one ham with 1 KW musses up more country than 472 hams with 36 watts, as I have. Consider that point of view, OM.

Having said enough for one communication, and exchanging cordial felicitations with ye ED, will say, 73,

A. R. Heydon.

WINDING VARIOMETER STATORS

1225 Hawthorne Ave., So.,
Minneapolis, Minn.

Editor, QST:

Amateurs who construct their own S.W. regenerative sets usually experience considerable difficulty in winding the field-frames of the variometers. Perhaps the following system will be found even better than the various schemes already offered.

Lay the frame in question upon a smooth surface, with the small opening down. Cut a strip of ordinary office blotting paper, and, after wetting same, line the inside of the frame taking care to fit the strip smoothly against the wood. Then mix about a pound and a half of plaster-of-paris to such consistency that it will readily run from the vessel when poured into the frame. Fill the latter until level with the top and let it stand for at least three-quarters of an hour. Remove the cast by tapping gently; the blotting-paper may be easily rubbed from same. Then proceed to wind the wire upon the cast, after which the inside of the frame is thickly shellacked and the form with the winding is inserted. Allow to stand for ten minutes only.

In again removing the cast, the upper turn of the winding is held in place (using a pair of screw-drivers or anything handy) while the cast is carefully and slowly pushed up. After the winding is set in the frame, another coating of shellac will help to keep it in place. The same cast may be used any number of times, so after the trouble of making one, the winding of frames will be comparatively easy.

Very truly yours,
W. C. Grover.

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THE THINGS WORTH WHILE

1627 Seventh Ave.,
Troy, N. Y.

Editor, QST:

There is a matter I want to get off my chest while the time is ripe. I heartily agree with Mr. Hutchinson's remarks in May QST. Some of our better relay stations are commercializing amateur relay work too much. If they want commercial routine and monotony why don't they enter the Merchant Marine? I am in favor of brief sending and a snappy style of relaying, but why should our best stations give us a 73 when we tell them NIL to their QRU. As you say, not all of us can be relayers, but we can do as good work as they, and are just as interested in knowing how someone 500 miles away likes our spark. One of the A.R.R.L. traffic rules says that no more "Greetings via Radio", messages are to be accepted. And why not?? I don't encourage small talk or chewing the rag over nothing by radio, but if a friend wishes to greet another friend in some other state, and do it by radio, why shouldn't we accept his message? How many people ever order goods or send very important messages via amateur radio stations? They generally choose the lesser evil and mail it.

The Hudson Valley has as good a trunk line as can be found anywhere. Starting at Schenectady, stations are located along the river with not more than 50 miles between any two. Daylight work is always a certainty. Some of our best eastern stations are near the New York terminal of this line. However, during the past season, I have started several messages for New York City and none of them ever reached their destination. Incidentally, those stations near New York City, and upon whom delivery of the message depended are perhaps just the ones who would commercialize amateur radio. Where was their commercial-like efficiency when these messages came through? The messages weren't "Greetings via Radio" either, but were of some importance. On the other hand, haven't the transcontinental test messages always been of a congratulatory or greetings nature?

We are in this game for pleasure and scientific advancement, not money. Our trials and tribulations in improving our stations is what keeps up our interest. If everything always functioned properly, many of us would soon tire of it. Even some of our best stations don't seem satisfied with merely operating their first-class sets. They design, construct, and test new apparatus for general amateur use. And I'll wager a dollar to a doughnut that it is this part of the game that keeps alive their interest.

Well, Eddy, you are a busy man, consequently I'll take no more of your valuable time. Would like to hear more of this subject from other fellow amateurs.

Best 73's,
E. M. Williams.
(Radio 2SZ).

A LETTER TO 3HJ

Marion, Mass.,
August 3, 1920.

Dear 3HJ:

Speakin' of oscillation transformers, do you use one of them things? or is it a straight hook-up from a spark gap to antenna, or a helix?

Aintcha 'fraid you'll melt your antenna? Do they have Radio Inspectors down there? Do they have decremeters? Thought possibly you used a slip-stick to figure it out.

Now, old sock, dontcha worry about us other fellers at all, 'cause we don't mind sitting there at all till you get thru. You're not so broad but what we might go up on 2,500 meters and skin thru possibly—it's only the wave lengths between 25 and 2,490 that we get you fairly good.

Now all jokin' aside, 3HJ—get a pair of "come alongs" and yank that primary and secondary apart, else I'll just havta build a bigger tuner.

Yours, till Pitts sells Ponzi an outfit,
"Speedo".

UNUSUAL RECEPTION

181 Waverly Place,
New York City.

Editor, QST:

While sending in my list of stations received thought I would mention a few other things which will undoubtedly interest readers of "Radio Communications by the Amateurs" in QST.

On the night of June 3, I had occasion to try very loose coupling between my primary and secondary circuits of my receiver—18" clear separation—and during a period of about ten minutes copied the following stations, all QSA: 1AK, 8ER, 8DA, 8XU, 8ZW. I think this speaks quite well for the use of loose coupling, as the tuning is exceedingly sharp under such conditions.

Taking advantage of the favorable weather conditions I tried my bed spring for an aerial and heard 1AK, 8DA, 3NB, and 2TF, all loud.

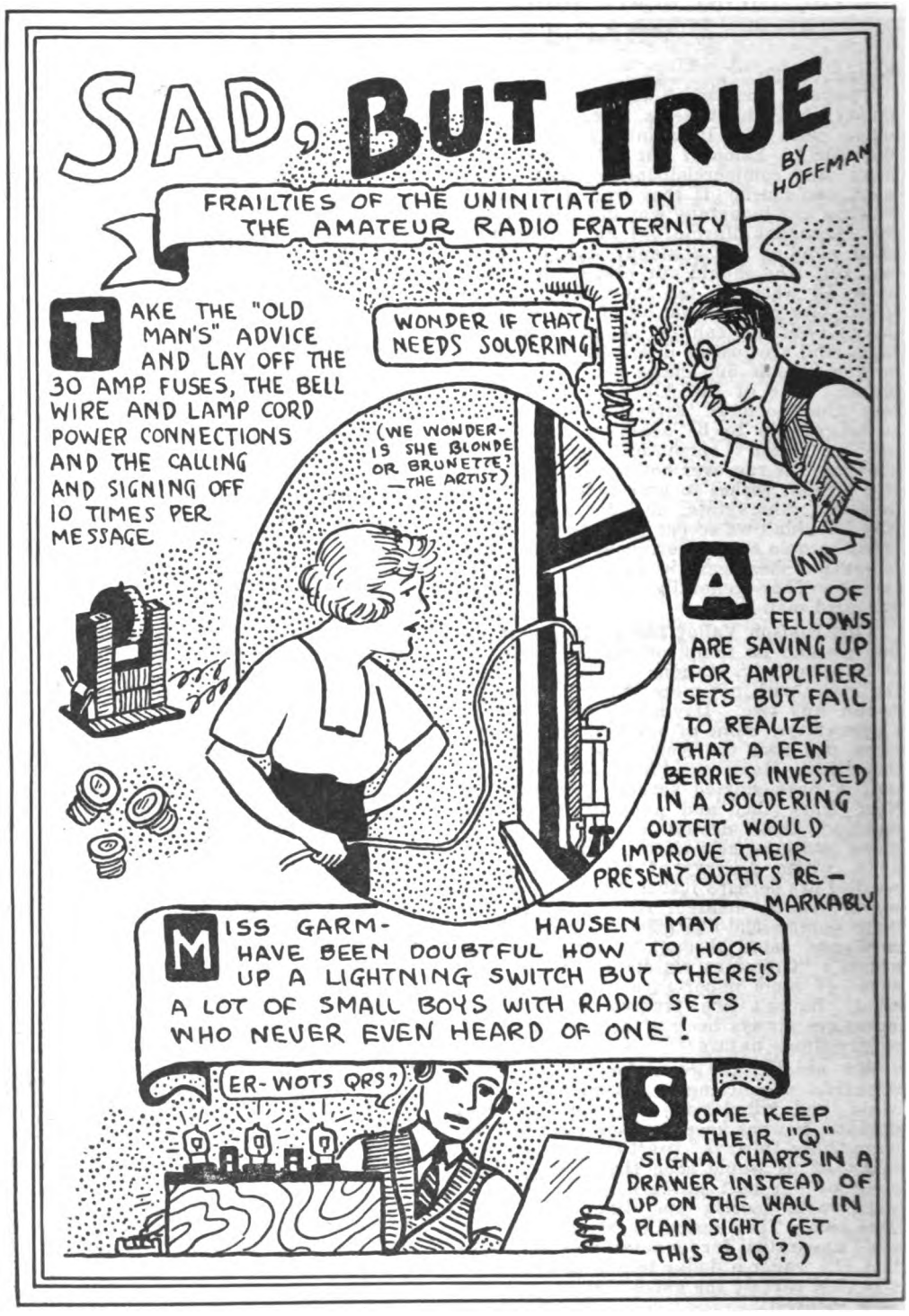
Might mention that later on the same evening I heard 9YB calling 9EC.

The night of June 9th also showed fine conditions, bringing in 1HAA very loud and 8CB on silicon detector.

CUL, 73 to everybody—de

A. Rechert,
2TT.

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CALLS HEARD

On account of the vast quantity of calls reported we must ask your co-operation in the following.

(1) List the calls on a separate sheet of paper—do not embody them in a letter.

(2) Arrange by districts from 1 to 9, and alphabetically thru each district; and run them across the page, not down a column.

(3) Put parentheses around calls of stations also worked.

(4) Omit initial or other unauthorized calls.

(5) State the period covered by your report.

1AW, HARTFORD, July 10—Aug. 9.

(1CK), (1CM), (1ES), (1FV), (1QP), (1SZ), (1TS), (1AAU), (1BBL), (1HAA), (1NAQ), (1VAD), 1VAO, (2DI), (2EL), 2ER, 2GK, (2JZ), (2MK), (2RK), (2RM), (2SH), 2TF, (2ZM), 2AJW, 3BG, 3BZ, 3CS, (3EV), (3GV), (3HB), (3HJ), (3HX), (3KM), (3NB), (NSF), 8BP, (8DA), 8DC, 8DV, (8ER), (8QM), 8WY, (8XK), 9ZN.

H. POLLOCK, PAWTUCKET,R. I., June 1—Aug. 1.

1AE, 1AK, 1AAU, 1AW, 1CK, 1EK, 1HAA, 1TS, 1YB, 2DA, 2FH, 2JU, 2NR, 2RM, 3EV, 3EY, 3GX, 3HJ, 3NB, NSF, 8CB, 8HW, 8MT, 8PG, 8RS, 8WY, 8XU, 9HA, 9ZN.

3WO, BALTIMORE, July.

1AE, 1AK, 1AW, 1EV, 1CM, 1HAA, 1TS, 1FUI, 1FW, 1TE, 1RK, 1TF, 1YU, 2BB, 2BK, 2BY, 2DA, 2JE, 2JU, 2QR(spark and mod. CW),2NF, 2XH, 2XJ, 2XU both (phone), 3BA, 3BE, 3BK, 3BT, 3BH, 3BZ, 3BU, 3CK, 3CQ, 3EN, 3FG, 3GO, 3HJ, 3IQ (CW), 3KM, 3NB, 3EH, 3RV, 3WF, NSF (mod. CW and phone), 4AA, 4EE, 4AO, 5AC, 5AO, 5AX, 8AW, 8BP, 8AC, 8DA, 8CS, 8EN, 8ER, 8AV, 8IB, 8HG, 8HP, 8NI, 8UA, 8WY, 8XK (mod. CW and spark), 8XU (mod. CW), 8XF, 8ZW, 9CC, 9AD, 9BT, 9ER, 9NQ, 9ZL, 9ZN.

1TS, BRISTOL, CONN., June 20—July 20.

1AE, 1AS, (1AW), 1AY mod. C.W. and phone, 1BAY, (1BBL), 1BJ, 1BM, 1CE, 1CK, (1CM, (1CZ), 1DQ, 1DR, 1DY, 1EAV, 1EP, 1ES, 1FB, 1FV, 1FW, 1GAI, (1GY), (1HAA), 1KAZ, 1LAX, (1NAQ), 1NO mod. C.W. and phone, 1QN, 1SN, 2AJW, 2AIM, 2ANN, 2AQQ, 2ASV, 2BK, 2CI, 2DI, 2DN, 2GR, 2JE C.W., 2JU, (2OA), 2OM, 2QR spk. and C.W., 2QV, (2RB), 2RH, 2RK, 2RM, 2SH, 2TF, 2WG, 2YM, 2ZL C.W., 2ZM, 3EN, 3EV, 3FB, 3FG, 3FN, 3GB, 3GO, 3HJ, 3HX, 3LS, 3NB, 3VJ, 3ZA, 3ZW, 8BB, 8BP, 8DA, 8DI, 8DV, 8EN, 8ER, 8FO, 8GB, 8HP, 8IK, 8LE, 8NI, 8QM, 8WY, 8XK mod. C.W., 8ZW, 9ZJ, 9ZN.

5ZN, EAGLE PASS, TEX.

(5AC), 5AG, 5AF, (5AL), (5AS), 5AO, 5AY, 5BG, 5BF, (5BJ), (5BO), 5BS, 5BT, (5BM), 5BY, 5BZ, 5CA, 5CX, (5DO), 5FH, 5GH, 5LL, (5YA), (5ZA), (5ZC), 5ZG, 5ZL, (5ZO), 6AL, 6CS, 6GE, (6GQ), 8ER, 9AB, 9AE, 9AJ, 9AP, 9BR, 9BT, 9CA, 9CN, 9CS, 9DU, 9EA, 9EF, (9EL), 9ER, 9FA, 9FB, 9FL, 9FT, 9FU, 9FZ, 9GL, 9GQ, 9GS, 9GV, 9GW, 9HN, 9HT, 9IF, 9II, 9IT, 9IX, 9JB, 9JD, 9JE, 9KJ, (9KV), (9LC), 9OT, 9OV, 9PI, 9PS, 9WE, 9YA, 9YO, 9ZJ, 9ZN.

8DA, SALEM, O., March.

1AW, 1CM, 2BM, 2BK, 2CS, 2IR, 2JE, (2WB), 2ZC, 2RB, 3AN, 3BZ, (3DH), (3EN), (3EV), (3FG), 3HA, (3HJ), (3NB), 3NV, (4AE), (4AG), (4AL), (4AT), 4AQ, 4CR, 4BQ, 5BS, (5DA), 5XA, 5YE, 5ZP, 5ZL, 8AGO, (8ER), 8FI, 8IV, 8IF, 8CD, 8JX, 8XP, 8NZ, (8XA), (8XU), 8ZV, 8XK, 9AJ, (9AU), 9CA, 9CE, 9DF, 9EE, 9ET, 9KO, 9LQ, 9MH, (9LC), 9YA, 9ZJ, (9ZV).

6BN, SAN FRANCISCO

6AK, (6BQ), 6CQ, 6CS, 6CM, 6FI, (6CV), 6DP, 6DK, (6EA), 6EB, 6ED, (6EJ), 6EK, 6EM, 6EN, (6ER), 6FE, 6FS, (6GI), 6GR, (6HZ), 6IH, 6JD, 6JI, 6JJ, (6JM), (6KA), (6KP), 6MH, (6NY), 6OE, (6OH), 6PQ, (6QR), (6UM), 6XZ, 6ZA, 7AD, 7BC, 7BP, 7BY, 7CC, 7CR, 7CW, (7CU), 7YS, 7ZB.

1GY, WORCESTER, MASS., June 12—July 10.
Worked: 1AW, 1AS, 1CM, 1FV, 1TS, 2JU, 2OA, 3HJ. Heard: 1BA, 1BM, 1BD, 1BT, 1BR, 1CE, 1CK, 1CZ, 1DY, 1DQ, 1DR, 1GM, 1JA, 1KAY, 1LAX, 1KL, 1PG, 1RZ, 2CM, 2EY, 2UD, 2AJW, 3KM, 8BB, 8DA, 8FO, 8TT, 8WY.

9GP, KENOSHA, WISC., Feb. to June

1AK, 1AW, 2FM, 2RR, 2WB, 2ZC, 3SK, 4AE, 4BQ, 5GP, 5ZL, 5ZU, 8AA, 8AL, 8DA, 8DW, 8ER, 8CY, 8CU, 8BP, 8EZ, 8FG, 8JJ, 8FA, 8NT, 8XI, 8ZA, 9AAU, 9AFK, 9AAP, 9ADI, 9ACA, 9AES, 9AAG, 9AFR, 9ACW, 9AE, 9AT, 9AW, 9AU, 9BR, 9BT, 9CL, 9CA, 9CE, 9FG, 9ES, 9HW, 9HH, 9ST, 9KO, 9KS, 9LZ, 9LC, 9MH, 9NZ, 9OR, 9OS, 9ON, 9PR, 9SQ, 9ST, 9TE, 9UG, 9UK, 9UY, 9VD, 9VK, 9ZC, 9ZN, 9ZL, 9ZX, 9ZP.

9CS, CLINTON, IOWA.

2SS, 4EA, 5AC, 5AL, 5BK, 5BO, 5DO, 5ZA, 5ZC, 5ZO, 8AA, 8AB, 8BP, 8DA, 8DO (8ER), 8FH, 8HG, 8IK, 8JQ, 9AK, 9AL, 9AP, 9AT, 9AU, 9AV, 9ACN, 9AAF, 9BB, (9CA), 9CW, (9DC), 9DH, 9DU, (9EE), 9ET, 9EX, (9EZ), (9GC), 9GK, 9GS, 9GX, 9HI, 9HJ, 9HT, 9HW, 9IT, 9JL, (9KV), (9LC), 9LH, 9LM, (9MQ), (9MS), 9NO, (9NV), (9OI), (9ON), 9OR, 9PI, (9QI), 9RP, 9ST, 9UU, 9ZL, (9ZN), (9ZC), 9ZX.

4DA, MACON, GA., March 17-30.

3EN, 3ND, 3HJ, 4AT, 4BK, 4YA, 5AL, 5CP, 5ER, 5FL, 5XA, 5ZP, 8DA, 8GB, 8GT, 8JJ, 8LA, 8LH, 8NA, 8NI, 8NZ, 8ZB, 9LF, 9QP, 9ZT.

1ES, BROOKLINE, MASS., March 2 to July 31

1AK, (1AW), 1BBL, 1BM, 1CAO, 1CBJ, 1CM, 1DT, 1EAV, 1EK, 1FB, 1FQ, 1FV, 1FW, 1GY, (1HAA), 1IAO, 1JAP, 1JY, 1KAY, 1LAX, 1NAQ, 1PAZ, 1RZ, 1SZ, 1TS, 1YB, 2AJW, 2ANN, 2AOP, 2BB, 2BG, 2BK, 2BM, 2BO, 2CD, 2CL, 2CS, 2CT, 2CY, 2DA, 2DR, 2EL, 2FS, 2GR, 2JE, 2JL, 2JN, 2JU, 2JZ, 2LO, 2ME, 2MK, 2NF, 2NP, 2OA, 2OM, 2OU, 2QR, 2QV, 2RB, 2RK, 2RL, 2SH, 2TF, 2UE, 2VA, 2WB, 2XH, 2XJ, 2XX, 2YM, 2ZC, 2ZL, 2ZM, 2ZS, 3AN, 3AW, 3BE, 3BH, 3BZ, 3DH, 3EN, 3EV, 3EW, 3EY, 3FB, 3FG, 3FR, 3GO, 3GX, 3HJ, 3HX, 3KM, 3MU, 3NB, 3NC, 3NV, 3OB, 3SJ, 3XH, 3ZA, 3ZW, 5CW, 8ABG, 8AJ, 8BP, 8BQ, 8CB, 8CE, 8DA, 8DC, 8DI, 8DV, 8DY, 8EN, 8ER, 8EV, 8FF, 8FO, 8FP, 8FW, 8GB, 8HP, 8HW, 8IK, 8JJ, 8LA, 8LI, 8MI, 8MT, 8NI, 8NQ, 8PG, 8QM, 8RQ, 8RS, 8VM, 8WY, 8XK, 8XU, 8YV, 9CE, 9MH, 9PV, 9ZJ, 9ZN, NSF.

7CU, VANCOUVER, WASH.

(5BR) (Canadian), 6AJ, 6AN, 6AT, (6AV), (6BR), 6BJ, (6BN), (6BQ), 6BZ, 6CD, (6CI), (6CO), 6CQ, 6CV, 6DH, (6DP), 6DK, 6DT, 6DY, 6ED, (6EJ), 6EN, 6ER, (6EX), (6FE), 6FI, (6FS), 6FX, 6FY, (6GF), 6GI, (6GK), 6GN, (6GR), (6HO), (6HP), (6IC), 6JD, 6JI, 6JK, 6JM, 6JN, 6KM, 6KP, 6OC, (6OH), 6ON, 6PQ, 6QR, 6QU, 6TV, (6UM), 6ZE, 6XZ, (7AD), (7AN), (7BF), (7BK), (7BH), (7BV), (7CB), (7CE), (7CW), (7HI), (7YS).

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2VA, HOBOKEN, N. J.
(1AE), (1AF), 1AK, 1AR, (1AS), (1AW), 1AZ, 1BB, 1BL, 1BM, 1CE, (1CK), 1CL, 1CM, (1DQ), 1DU, 1EAV, 1EM, 1FQ, 1FV, 1FW, 1GAI, 1HAA, 1IR, 1JAP, 1KT, 1RN, 1SN, (1TS), 1YB, (1ZA), 1ZV, 2BM, (2TF), 3AD, 3AK, 3AN, 3BB, 3BZ, 3CC, 3CH, (3CS), (3CV), (3DH), 3EM, 3EN, 3EV, (3FG), 3HG, (3JR), 3LZ, 3MU, (3NB), 3OB, 3OI, 3XE, 3ZA, 3ZS, 3ZW, 3ZY, (NSF), 4AE, 4AN, 4AT, 4CC, 5DA, 5ZA, 8AA, 8AB, 8AB, 8AL, 8ALE, 8BP, 8BQ, 8CB, 8CC, (8DA), 8DI, 8DV, 8EJ, 8EN, 8ER, 8ES, 8FD, 8FF, 8FH, 8GB, 8HG, 8HH, 8HP, 8IC, 8IF, 8IK, 8IL, 8JJ, 8JQ, 8LA, (8LH), 8LI, 8LK, 8MT, 8NI, 8OU, 8QJ, 8RS, 8TK, 8UD, 8WY, 8XA, 8XK, (8XU), 8ZY, 9AJ, 9AK, 9AU, 9BR, 9BT, 9CC, 9CJ, 9ER, 9HD, 9HJ, 9HN, 9HR, (9HW), 9IO, 9IT, 9KF, 9KV, 9LN, 9PM, 9ZJ, 9ZL, 9ZN, 9ZW.

2DX, SUMMIT, N. J., Apr. 1—June 14.
1AE, 1AW, 1DN, 1HA, 1JN, 1LW, 1QN, 1TS, 1HAA, 2QR, 2CG, 3BB, 3BE, 3CK, 3CV, 3DH, 3HJ, 3LZ, 3LY, 3MS, 3ZA, 3ZS, 8AU, 8BO, 8DA, 8DW, 8ER, 8EN, 8MT, 8NS, 8WG, 8WY, 9ZN. Aso following radiophones and C. W.: 2ADJ, 2EX, 2XB, 2XJ, 2XG, 2XX, 2XR, 2XL, 2ZL, 2ZM, 2QR, NSF.

1CE, BROCKTON, MASS.
(1AW), (1AW), (1CM), (1EK), (1EAV), 1FA, 1FM, 1FQ, 1FW, (1HAA), 1JH, 1JN, 1JU, 2AD, 2AK, (2BK), 2BM, 2CB, 2CM, 2DA, 2DC, 2DL, 2DM, 2DZ, 2EF, 2FE, 2FM, 2GE, (2GR), 2IE, 2ID, 2IK, 2IN, 2JE, 2JM, 2JU, 2KY, 2LO, (2ME), 2NW, (2OA), 2RJ, 2RV, 2TA, 2TF, 2TU, 2WA, 2XJ, 2ZC, 2ZL, 2ZR, 2ZS, 3AA, 3AN, 3AL, 3AR, 3BZ, 3EN, 3EV, 3FX, 3GE, ()HJ), 3HW, 3MU, 3NA, 3NB, (3NV), 3VJ, 3ZA, 3ZS, 8AB, 8AY, 8BB, 8CB, 8DA, 8DV, 8EN, 8GB, 8NS, 8XU, 8XK, Canadian 3Z.

9JE, COLORADO SPRINGS, COLO.
5AC, (5AS), 5AL, 5AV, 5AY, 5BG, 5BO, 5CP, 5DO, 5DU, 5ZA, 5ZB, 5ZC, 5ZG, 5ZL, 5ZO, (6AL), 6EY, (6IZ), 9AB, 9AJ, 9AW, 9BR, 9BT, (9CA), (9CN), 9CW, 9DV, 9CE, 9EL, 9EW, 9EY, 9FB, 9FC, 9FL, 9GS, (9HI), 9HT, (9IF), 9IX, 9JB, 9LC, 9NQ, 9OB, (9PI), 9PN, (9RV), 9YA, 9YO, 9ZC, 9ZN.

CAN. 2BF, MONTREAL, March
1AL, 1AS, 1AW, 1SZ, 1ZA,—2BK, 2BM, 2CS, 2DA, 2DS, 2GR, 2IR, 2JU, 2RS, 2ZC, 2ZM, 3OH, 3EN, 3EV, 8HJ, 8NB, 3NC, 8NV, 8NW, 8ZS, 5ZL, 8AIA, 8BB, 8CB, 8OV, 8DA, 8EN, 8ER, 8HA, 8HG, 8HH, 8HJ, 8IR, 8IL, 8MZ, 8NO, 8OU, 8XA, 8XU, 8XK, 82W, 9AU, 9ZJ, 9ZL, 9ZV.

CANADIAN, 3AB, TORONTO, additional.
2AN, 2JU, 3BZ, 3HJ, 8DT, 8EN, 8FR, 8GI, 8HG, 8IK, 8JF, 8LA, 8MT, (8MZ), 8NZ, 8OZ, 8XU, 9AJ, 9AX, 9HW, 9ZL.

9ZQ, OELWEIN, IOWA, Apr. 2d.
(9AAL), 9AD, 9AU, 9AX, 9CE, 9CN, 9FG, 9FI, (9FP), 9FW, 9GC, 9HI, 9HR, 9HT, 9HW, 9JN, (9JT), 9KE, 9KI, (9KV), 9LC, 9LH, 9LQ, 9LR, 9LV, 9MH, 9NQ, 9OE, 9ON, 9OV, 9PI, 9SS, 9UG, 9WI, 9ZC, 9ZL, 9ZT, 9YA, 8CB, 8LA, 8NZ, 5BT, 5BG, 5EN, 5EO, (5ZA), 5ZL, 5ZU, 5YE.

4AT, FT. PIERCE, FLA., March.
1AL, 1AW, (1FX), (2ZC), (3DH), 3IR, 1AC, 4AE, 4AG, (4AL), 4AN, (4AO), 4AR, 4ES, 4YA, 5XT, 5ZA, 8DA, (8LA).

7CR, PORTLAND, ORE., March
6AD, (6AE), 6AH, (6AK), 6AL, 6AO, 6AT, (6BQ), 6BR, 6BT, 6BU, 6CC, 6CO, 6CQ, 6CU, 6CV, 6DK, 6DY, 6EA, 6EB, (6EJ), 6EN, 6FE, 6FH, 6FI, 6FN, 6FY, 6GI, 6, 6HO, 6HQ, 6JD, 6JR, 6JM, 6KL, 6MZ, 6NE, 6RH, 6ZA, 6ZE, 7AD, (7CC), (7CW), 7YB, (7YS).

5ZX, HOUSTON, TEX.
(4BZ), (5AD), (5AG), (5AL), 5ED), (5EJ), (5EO), 5YA (5ZA), (5ZC), (5ZG), 5ZN, (5ZU), 8ER, 8FX, 9AJ, (9AU), (9BT), (9CA), 9CS, 9CW, 9EL, 9ET, 9HI, 9HN, 9HT, 9IF, 9IT, 9JE, 9KF, 9KO, (99KV), (9LC), (9RP), 9ZL, 9ZN, 9ZT, (9ZU), (9ZV), CW.

9IO, NEWPORT, KY.
1AW, 2FG, 2XG, (Phone and modulated tel.), 2ZM, 2ZS, 3AN, 3BZ, 3EN, 3DH, 3NB, 4AE, 4AG, 4AL, 4BQ, 5AL, 5AS, 5BT, 5DA, 5DO, 5YA, 5YE, 5ZC, 5ZL, 8AA, 8CB, 8DA, 8EN, 8ER, 8FF, 8FH, 8FI, 8HA, 8HH, 8IK, 8IV, 8JJ, 8LA, 8NO, 8NI, 8WY, 8XK, 8XA, 9AB, (ex. 9AES), 9AU, 9BT, 9BR, 9AJ, 9EE, 9ER, 9HA, 9HN, 9HT, 9IT, 9KO, 9KV, 9LQ, 9LF, 9MK, 9NQ, 9ZJ, 9ZL, 9ZN, 9ZT.

6ZA, SALT LAKE CITY, to March.
6EA, 6JT, 6AK, 6BR, 6FU, 6BU, 6NQ, 6DY, 6JM, 6EI, 9RP, (6AE), (6AT), (6CQ), (6HH), (6GQ), (6BQ), (6CS), (9JE), (733), (5ZA), 6FE.

6DT, FRESNO, CAL.
5ZA, 6AE, 6AG, 6AH, 6AJ, 6AK, 6AL, 6AM, 6AN, 6AT, 6AY, 6BJ, 6BQ, 6BR, 6BS, 6CA, 6CC, 6CI, 6CL, 6CM, 6CO, 6CP, 6CQ, 6CV, 6DI, 6DP, 6EB, 6EF, 6EJ, 6EL, 6EN, 6ER, 6EX, 6FE, 6FI, 6FN, 6FS, 6FX, 6GC, 6GH, 6GK, 6GQ, 6HG, 6HH, 6HU, 6IH, 6JD, 6JE, 6JG, 6JI, 6JK, 6JM, 6JU, 6ZA, 7BP, 8BR, 7CC, 7CN, 7YS, 7ZB.

9BE, CHICAGO, March.
2ZS, 3DH, 4BZ, 4AE, 4YA, 4BH, 5ZL, 5BT, 5AL, 5YE, 5ZV, 5BO, 7BD, 8CB, 8ER, 8EN, 8DL, 8DA, 8IK, 8ZW, 8HG, 8NZ, 8ZL, FH, QAJ, 9CO, 9RP, 9LC, 9KV, 9DL, 9BT, 9PY, 9ZJ, 9ZV, 9ZP.

NOT PREVIOUSLY REPORTED, DE 3FG, PORTSMOUTH, VA.
1HAA, (2BB), (2BM), 2ME, 2RL, 2TF, 3BA, 3BO, 3GR, (3GX), 3HG, 3KM, 3MU, (3NV), 3XH, (4CC), 8DY, 8EJ, 8FD, (8NI), (8WY), 9FG.

3GX, READING, PA.
1AK, (1AW), 2DA, (2JE), (2BM), 2ZM, 3BZ, 3CN, 3EN, (3HJ), (3KM), 3NB, 3XC, 8BA, 8BP, (8DA), 8DC, 8DI, (8DJ), 8EN, 8ER, 8IK, 8LA, 8LJ, 8MT, 8NI, (8WY), 8XA, 8XU, 8ZR, 8ZT, 8ZW, 9ZN.

CANADIAN 3Z, FARNHAM, QUE., May 15-19
Canadian: 2AE, 2AM, 2AK, 2BA, 2BF, 2BN, 2WA, 2WB. American: 1CN, 1CM, 1CI, 1HAA, 1JS, 1JT, 1SN, 1TS, 2DR, 2EV, 2JK, 2QF, 2KJ fone, 2ZM, 2ZR, 2FK, 3GO, 3HJ, 3NV, 8CB, 8FP, 8KU, 9FO.

3KM, WASHINGTON, D. C.
(1AE), 1AS, (1AW), 1BL, 1CK, 1CL, 1CM, 1DQ, 1EP, 1GX, 1KT, 1RN, 1SQ, 1SZ, 2BB, 2BK, (2BM), 2CB, 2CC, 2CS, 2CY, (2DA), 2FG, 2IR, (2JE), 2JM, (2JU), 2LO, 2LT, 2ME, 2RB, 2RR, (2TF), 2VA, 2XG, 2ZC, 2ZM, (2ZS), (2AR), (3AA), 3AK, 3AN, 3BG, (3BZ), 3CM, 3CS, 3CV, (3EE), (3EN), 3EQ, 3EV, 3FB, (3GO), (3GX), 3GZ, (3HJ), 3IB, 3IY, 3NB, 3NC, 3NP, 3NV, 3ZA, 4AA, 4AL, 4AO, 4AT, 4GC, 4CP, 5DA, 8AO, 8BP, 8BQ, 8BV, 8CB, 8CC, 8CE, 8DA, 8DE, 8DV, 8DW, 8EF, 8EN, 8ER, 8EV, 8GB, 8GI, 8GZ, 8HA, 8HD, 8HF, 8HG, 8HR, 8HY, 8IH, (8IK), 8IL, 8IN, 8IV, 8JJ, (8JQ), 8KE, 8KP, 8LA, 8LC, 8LI, (8MB), 8MN, 8MT, 8NF, 8NI, 8RS, 8RW, 8SH, (8WY), 8XA, 8XK, 8XU, 8ZV, (8ZW), 8ZY, 9AJ, 9FA, 9HA, 9HD, 9HG, 9HU, 9IT, 9KF, 9LQ, 9MK, 9MN, 9ZJ, 9ZL, 9ZN.

CANADIAN 3FE, NAPANEE, ONT.
1AW, 1CE, 1FG, 1HA, 1TS, 2AP, 2JM, 2JU, 2PL, 2SH, 2TF, 2XJ (C.W.), 2XN, 2XK (C.W.), 2ZL (C.W.), 3AB (Can.), 3AC (Can.), 3HJ, 3NV, 3BO, 3XF, 8AB, 8BB, 8ER, 8FG, 8FO, 8KZ, 8MT, 8NI, 8QE, 8WY, 8XK (C.W.), 8XU, 8YA, 9CF, 9ZJ, 9ZN.

2TT, NEW YORK CITY, May 1—June 11.
1AK, 1AW, 1CK, 1CM, 1DQ, 1DY, 1HAA, 1IAV, 1JG, 1RZ, 1SE, 1SN, 1YB, 2DA, 2TF, 3AW, 3BZ, 3BE, 3DC, 3DS, 3EN, 3EV, 3FB, 3HJ, 3GX, 3NB, 3NV, 3NW, 3PB, 3SO, 3XC, 3ZA, 3ZW, NSF, 8CE, 8DA, 8ER, 8HP, 8IK, 8LI, 8MT, 8NI, 8WI, 8WY, 8XU, 8ZW, 9LQ, 9YB, 9ZN, 9ZV.

Heard by L. P. Wood, 44 Dufferin Ave., Brantford, Ont., Canada. 100 miles northwest of Buffalo, up to March 1.
1AE, 1AK, 1AW, 1DU, 1NR, 1RN, 2BB, 2CB, 2CC, 2BM, 2CG, 2FG, 2JU, 2DA, 2RB, 2JZ, 2JE,

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:GR, 2SH, 2QB, 2ZC, 2ZS, 2ZL, 3BZ, 3AA, 3AF, :BH, 3MN, 3GO, 3KM, 3EN, 5DA, 8AK, 8BR, :CE, 8CB, 8CD, 8CI, 8DA, 8DV, 8DF, 8EN, 8ER, :FQ, 8FP, 8HH, 8HY, 8JQ, 8IB, 8IL, 8JC, 8FO, :OI, 8JJ, 8GB, 8HG, 8MZ, 8XA, 8XU, 9AJ, 9CW,)DF, 9FE, 9BJ, 9AU, 9CA, 9HT, 9HK, 9LF, 9LQ,)IT, 9KO, 9MK, 9ZL, 9ZN, 9XA, 9ZF.

7DG, HEMPEL, PORTLAND, ORE.

:AE, 6AH, 6AJ, 6AK, 6AM, 6AT, 6BE, 6BN, 6BQ, :BR, 6CC, 6CN, 6CO, 6CP, 6CS, 6CN, 6CV, 6DK, :DY, 6EA, 6EB, 6EJ, 6EN, 6FI, 6FJ, 6FN, 6FS, :FY, 6GA, 6GG, 6GQ, 6JD, 6JK, 6JM, 6JQ, 6JR, :KL, 6KO, 6PW, 6RA, 6XZ, 6ZA, 7AD, 7BF, 7CB, 7CC, 7YS.

8CN, GENESEO, N. Y.

1AL, 1AW, 1BM, 1CK, 1CZ, 1QM, 2BM, 2KM, 2CC, 2GR, 2IR, 2XX, 3NV, 3KM, 3HJ, 3SU, 3SP, 8ABG, 8AEX, 8AP, 8BQ, 8DA, 8EK, 8EL, 8EN, 8ER, 8FC, 8GI, 8GG, 8HA, 8LN, 8LY, 8OO, 8PI, 8QK, 8SH, 8SL, 8VM, 8WY, 8XG, 8XU, 8ZK, 9GJ, 9XN.

8OJ, BIRMINGHAM, MICH.

1AW, 2CB, 2BZ, 2DH, 2XX, 2XJ, 2ZM, 3BZ, 3DH, 3BV, 4AT, 5DA, 8ACY, 8ABG, (8BP), 8CD, 8CF, 8CU, 8DA, 8DL, 8DZ, 8DI, 8DV, 8DJ, (8EN), 8ER, 8EB, 8EF, 8GI, 8GQ, 8HM, 8HA, 8IF, (8JF), 8JJ, 8LA, 8KO, 8KA, 8LQ, 8EW, 8KC, (8MT), 8NI, 8RP, 8TT, 8VD, 8WS, 8WY, 8XK, 8XU, 8YV, 8ZI, 8ZW, 8ZV, 8ZY, 9AU, 9CE, 9EL, 9GX, 9HR, 9HI, 9HW, 9FU, 9GO, 9JA, 9JT, 9KV, 9KM, 9KF, 9LQ, 9MO, 9NZ, 9RJ, 9SR, 9UK, 9YB, 9ZF, 9ZL, 9ZR, 9ZT, 9ZN, 9AJ, 9ZJ.

8EA, N. S. PITTSBURGH, July 30.

1AW, 1AU, 1AD, 1NB, 1AE, 2EN, 2EC, 2FA, 3EN, 3CM, 3EW, 3KM, 3VM, 3NB, 3HJ, 3ND, 8NX, 8CB, 8CL, 8UY, 8AX, 8LA.

6EB, LOS ANGELES

(5ZA), (6AE), (6AG), (6AK), ex-6AL, 6AM, 6AT, 6BA, 6BB, 6BJ, (6BQ), 6BR, 6BZ, 6CE, 6CI, 6CL, (6CO), 6CP, 6CQ, (6CS), (6DK), 6DY, (6EJ), 6FE, 6FN, 6GL, 6GQ, 6HH, (6JQ), 6ZA, (7ZB), 7CC, 7CR, (7DK), 7BP.

9HT, OMAHA, NEBR.

(5AC), 5AL, (5AS), (5DO), 5YA, (5ZA), 8HA, (8HG), (8WQ), 9AC, 9AJ, (9AK), 9BR, 9BT, (9CA), (9CN), (9CS), 9CW, 9DR, 9DS, 9EE, (9FA), (9FL), (9FZ), 9GS, (9HB), 9HZ, 9IX, 9JE, (9KV), (9KW), 9LC, (9LN), 9OB, 9OI, 9ON, 9PQ, (9YA), 9YO, 9ZC, 9ZJ, 9ZL, 9ZN.

6JQ, NAPA, CALIF.

(6AA), (6AE), (6AH), (6AJ), (6AK), (6AM), (6AN), (6BE), (6BK), (6BN), (6BR), 6BU, (6BY), (6CA), (6CC), (6CH), (6CD), 6CP, 6CV, (6DY), (6EB), (6EJ), (6EX), 6FE, 6FN, 6FY, (6GH), 6GR, (6HP), (6IM), 6JL, 6JM, 6JN, 6JR, 6KM, 6KT, 6PH, 6PX, (6QE), 6XB, 6ZE, 7CM, 7EW, 7DK, 7CH.

5AD, NEW ORLEANS, February

4AN, 4AE, (5AB), 5AG, (5AL), 5BO, 5DO, 5BZ, 5FS, 5AU, 5DU, 5BB, 5ED, 5ZA, 5ZG, 9AJ, 9BG, 9BR, 9BT, 9CN, 9EL, 9FU, 9FZ, 9KO, (9KV), 9HT, 9HI, 9HN, 9NQ, 9PK, 9RP, 9LK, 9IW, 9KF, 9FF, 9NZ, 9ZU, 9ZL, 8DA, 8EI, 8ER, 8FH, 8LA, 8HG, 8IX, 8GB, 8IT, 8IC, 8RN, 8DC, 8BD, 8ZU.

8LF, CROFTON, PA., July

1AW, 1FB, 1HAA, 2AJW, 2AQR, 2JU, 2RK, 2TF, 2YM, 2ZL (spk. and undampt), 3CM, 3EN, 3EV, 3EW, 3FG, 3GO, 3GR, 3HJ, 3KM, 3NB, 4YA, 5YH, 8BP, 8BV, 8CF, 8DA (spk. and undampt), 8DI, 8DS, 8ER, 8FD, 8FI, 8GB, 8LA, 8JU, 9FA, 9KN, 9NV, 9ZJ, 9ZN.

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Moorhead Transmitting Tubes, 600 Volt	7.50
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DeForest Standard VT Socket	1.50
DeForest P-401 Audion Panels	14.25
Paragon Panel Rheostat	1.75
Esbro Grid Condensers, .0005 MF	.35
Corwin Dials, 3" diam.	1.30
Corwin Dials, 3⅞" diam.	1.70
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Acme C.W. Trans. 200 W.	20.00
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¼ KW	16.00
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Grebe Two Stage Amplifier	45.00
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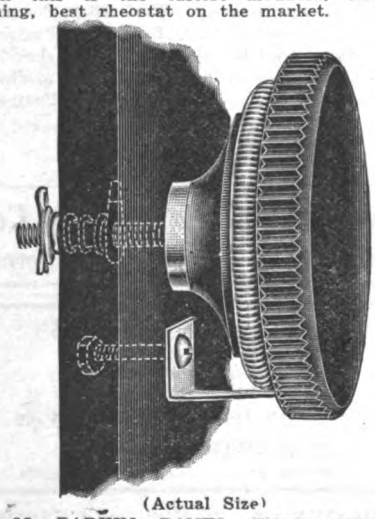
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THE OFFICIAL ORGAN OF THE A.R.R.L.

QST

OCTOBER, 1920

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QST

A Magazine Devoted Exclusively to Amateur Radio

Bulb Oscillators for Radio Transmission

By L. A. Hazeltine

Professor of Electrical Engineering, Stevens Institute of Technology

Presented at meeting of the Radio Club of America, Columbia University, April 30, 1920

PART I.

Valves as Rectifiers and as Oscillators

The unilateral conductivity of certain vacuous or gaseous conductors permits their employment as **electric valves** to alternately open and close an electric circuit, analogously to the use of mechanical valves to alternately interrupt and permit the flow of air or steam. The simplest use of a valve is to convert an alternating or intermittent flow into a continuous flow; for this will be accomplished automatically by a valve which permits a flow only in one direction. Thus automatic valves are used in reciprocating air compressors to give a continuous discharge of air, although the motion of the piston is alternating; and similarly electric **rectifiers** (such as the arc rectifier, the Tungar rectifier, the Fleming valve, etc.) act as automatic valves to convert an alternating current into a direct current.

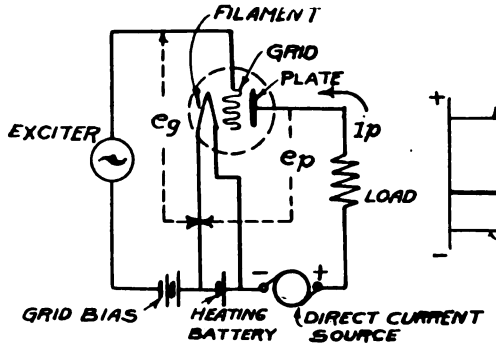
The reverse operation, the conversion of a continuous flow into an alternating flow, can be automatically accomplished only by a valve which is inherently unstable; otherwise a positive (non-automatic) control of the valve is required, either by an independent means having the desired frequency or by the alternating flow produced. The mouth-piece of a wind musical instrument and the ordinary arc oscillator are examples of mechanical and electric valves which produce oscillations by their inherent instability. Bulbs having considerable gas, of either the two-electrode or the three-electrode types, may be electrically unstable and so can act in this manner as electric oscillators, as has been found with some audions without the normal feedback; also the dynatron, a particular form of three-electrode bulb, acts as an oscillator by reason of instability. Oscillators having a positive valve control, however, are those in which we are here particularly interested, especially **self-excited oscillators** whose valve action is controlled by the alternating flow produced, as exemplified by the steam engine and by the ordinary three-electrode bulb oscillator (audion, pliotron, etc.). In the steam engine the valves, which admit steam to alternate ends of the cylinder and so convert the continuous flow in the steam line into the alternating motion of the piston, are themselves controlled by this motion. Similarly in the three-electrode bulb oscillator the grid whose varying potential periodically interrupts the plate current and so converts the direct-current power supplied to the plate circuit into alternating-current power, is itself controlled in potential by this alternating current. Instead of this electrostatic valve control, self-excited oscillators may have electromagnetic valve control, which has been practically applied in various ways.

Electrostatically Controlled Oscillator

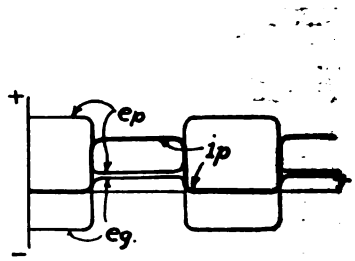
This paper will refer specifically to the electrostatically controlled oscillator, employing a bulb with three electrodes: the cathode, in the form of a filament heated to incandescence; the anode, often in the form of a plate; and the control electrode, usually in the form of a grid interposed between the filament and the plate. Electrons emitted by the filament by virtue of its temperature leave the immediate neighborhood of the filament at a rate depending on the combined effect of the plate potential and the grid potential, and constitute the "space current". In all ordinary bulbs the effect of a given potential at the grid exceeds by several times the effect of an equal potential at the plate, but this is

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not essential. In other words, the "amplification constant" of the bulb (defined as the quotient of the change in plate potential required to cause a given small change in space current, divided by the change in grid potential to give an equal effect) is usually above 5, but could be less than unity without prohibiting oscillation. When the grid is negative it tends to prevent



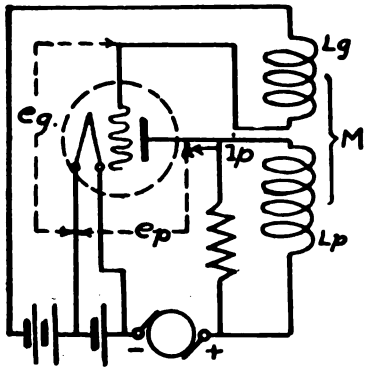
-FIG. 1a.-



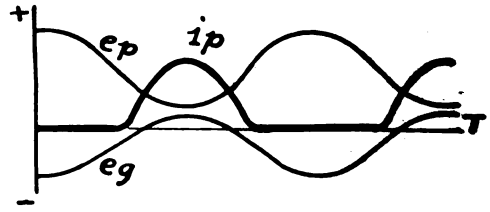
-FIG. 1b-

electrons from leaving the filament, and if sufficiently negative will reduce the space current to zero, thus opening the electric circuits through the bulb. On the other hand, when the grid is positive, it will tend to draw more electrons from the filament, thus raising the space current and providing relatively low-resistance paths through the bulb. When the grid is negative, practically no electrons reach it, though electrons may pass through it to the plate; and even when the grid is positive, fewer electrons usually reach it than reach the

reference to the separately excited oscillator of Fig. 1a. The "exciter" may be an alternating current generator having a rectangular voltage wave or it may be a periodically operated reversing switch connected to a battery. In combination with the "grid bias" it causes the grid potential to be alternately slightly positive and highly negative, as represented by the wave e_g, Fig. 1b. The highly negative grid potential interrupts the plate current entirely, while the slightly positive grid potential permits the plate current to flow readily, as indicated by the wave i_p. The grid current (not shown) will vary similarly to the plate current, but will be smaller. The plate potential (in this figure) will be equal to the voltage of the "direct-current source" when the plate current is zero, and will fall to a low value when the plate current flows (that is, when most of the



-FIG. 2a.-



-FIG. 2b.-

plate, on account of its smaller surface. Thus the space current is made up of the plate current and the grid current, the latter normally being zero or relatively small.

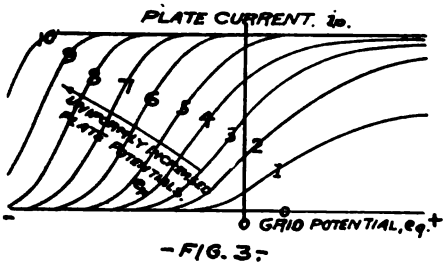
The physical action in a bulb oscillator may be most simply examined by refer-

voltage of the source is used in the "load"), as indicated by the wave e_p. Evidently the variations in plate potential are in the opposite sense to the variations in grid potential; this condition is essential to the production of alternating-current power and must be arranged for in self-excited

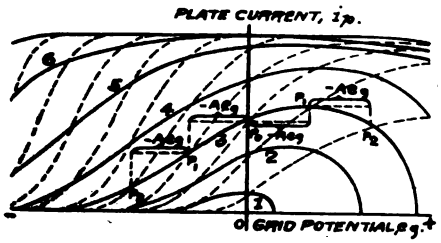
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oscillators by proper polarity connections.

Conditions in Fig. 1 are simple and ideal. Each of the operating currents and voltages has only two different values during a cycle—the open-circuit value and the closed-circuit value. The internal losses in the bulb will be small, for current flows only when the corresponding potential is low.



-FIG. 3.-

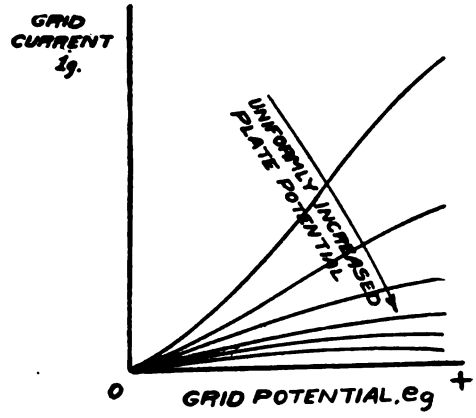


-FIG. 4.-

Let us try to obtain the results of Fig. 1 in a self-excited oscillator by connecting the primary of a transformer across the load and the secondary in the grid circuit, as in Fig. 2a. If it were possible to have a transformer without exciting current, so that it would transform voltage but would not affect the currents in the circuits, and if all inductive and capacity effects were absent, then the waves of Fig. 1b could theoretically be obtained, though even then the frequency would be indeterminate. As a matter of fact, the transformer must take exciting current and the circuit parts must have capacity; so the simple results attained by positive valve control in Fig. 1 cannot now occur. Instead, we shall have the following conditions to satisfy: first, the variation in grid potential must be in phase with the variation in plate potential, due to assumed close coupling of the transformer coils; secondly, the current must vary in phase with the two potentials, since these determine the current by their combined action; and thirdly, the relation of plate current to plate potential must be that fixed by the impedance of the plate circuit external to the bulb. The last two conditions together show that the external plate circuit must act like a **pure resistance**, inasmuch as its current and voltage must be in phase. Therefore an oscillation can occur only at that frequency which will make the capacity and inductance associated with the plate circuit resonant with one another and hence non-inductive in their combination. Usually in practice, the capacity and inductance are effectively in parallel and are sharply tuned, causing the plate potential, and thence the grid potential, to be almost free from harmonics, as represented by the sine wave curves e_p and e_g, Fig. 2b. The plate current will then be zero while the grid is highly negative and will roughly follow the potentials during the remainder of the cycle, as represented by the wave i_p of the same figure. The grid current will vary in the same general way, but with a longer zero interval.

Thus it is seen that the ordinary self-excited oscillator cannot have sharp opening and closing of the circuits through the bulb; but instead the valve action serves to gradually change the resistance of the plate circuit. Such valve action is analogous to the slow opening and closing of the valves of a steam engine, resulting in "wire-drawing", or gradual throttling, and is undesirable for the same reason—loss in energy in the resistance (friction) interposed. Later in this paper will be shown (Fig. 11) a circuit devised and used by the author for giving sharp valve action in bulbs. As is well known the corresponding result in steam engines is one of the main advantages of the Corliss valve.

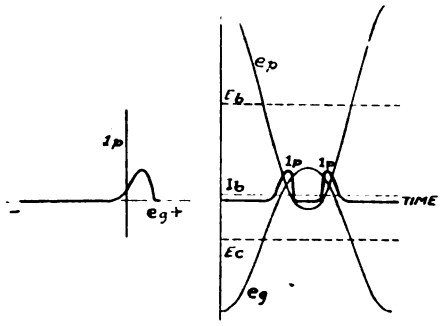
For simplicity's sake, the load resistance has been shown in Fig. 1 and 2 directly in the plate circuit and so will carry both direct and alternating currents having the same order of magnitude. In practice, oscillators are arranged, by the use of transformers or sharply tuned circuits or both (Fig. 9 and 10), to have a path of low resistance for the direct plate current and of suitably high effective resistance for the alternating plate current. The oscil-



-FIG. 5.-

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lator can then serve to convert the direct-current power of the plate generator or battery into alternating-current power with an efficiency that compares favorably with that of other electrical converting apparatus of like power rating. The grid-bias



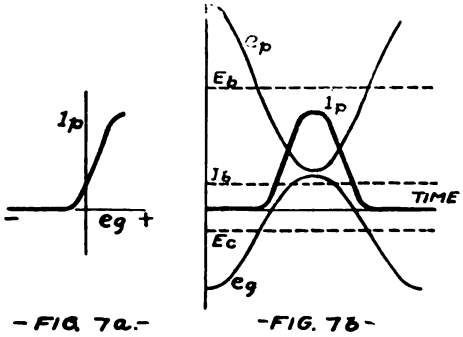
-FIG 6a.- -FIG 6b-

-REPRESENTING UNDERLOAD-

battery shown in Fig. 1 and 2 is a sink, not a source, of power, and is usually replaced by a resistance (R_c, Fig. 9 and 10) in which the grid direct current will cause a like voltage drop. The plate generator and this bias resistance are shunted by condensers to afford low-impedance paths for the alternating parts of the plate and grid currents respectively.

Characteristic Curves

The details of the action of a bulb oscillator may be determined as described below from the characteristic curves, in which the plate and grid currents are plotted against the grid potential for constant values of the plate potential. Fig. 3 shows a family of "mutual characteristic curves" of plate current and grid potential, the numbers on the curves representing



-FIG 7a.- -FIG. 7b-

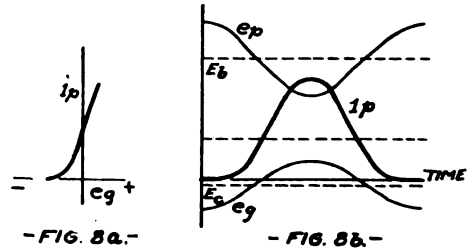
REPRESENTING NORMAL LOAD.

the relative plate potentials, which are constant for each curve. The "grid characteristic curves" of Fig. 5 are less important but are needed for a complete analysis; the grid current is plotted against grid potential for various constant plate potentials.

It is convenient to plot curves showing the relation between the plate current and the grid potential, taking into account such variations in plate potential as occur during oscillation. These are called derived characteristics. Under ordinary conditions the changes in plate potential bear a constant ratio to the changes in grid potential, represented by (n) in the equation below (which is not, of course, the usual amplification constant):—

$$-\frac{\delta e_p}{\delta e_g} = n = \text{constant},$$

δe_p and δe_g normally having opposite signs in order that power shall be given out from the plate circuit. The derived characteristic curves for this condition are shown by the full lines of Fig. 4, which are obtained from the normal characteristic curves reproduced from Fig. 3 and shown dotted. To plot one of these curves— say $P_2P_1P_0$—the increment δe_p in plate potential between the successive dotted curves is divided by



-FIG. 8a.- -FIG. 8b-

-REPRESENTING OVERLOAD-

the constant n, to give the corresponding decrement ($-\delta e_g$) in grid potential. Then starting from any point on one of the dotted curves, lay off δe_g horizontally, and draw a vertical line to the succeeding dotted curve. This gives one point on the new derived curve. In a similar manner other points on the new curve may be obtained. There will evidently be a different family of such derived characteristic curves for every value of n.

Derived grid characteristic curves may be constructed by a similar process from the normal family of curves in Fig. 5.

In Fig. 6a, 7a and 8a are shown derived mutual characteristic curves, which are fixed for a given bulb by the alternating and direct components of the plate and grid potentials. Assuming sinusoidal variation of these potentials, their waves may be plotted as e_p and e_g, Fig. 6b, 7b and 8b, and thence the waves of plate current, i_p, may be plotted by reference to the characteristic curves. Similarly the wave of grid current could be plotted, if desired, by reference to derived grid characteristic

(Continued on page 30)

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Radiotelephotophone Personalities

By "Tewpieye"

This is the wildest story that has drifted into the QST Factory in many a day. QRM from these radiophones did it, we guess.—Editor.

HEN Muller (2BH, maybe you know him), while more or less a facetious individual, occasionally shows indications of at least mediocre intellect. During one of these rare manifestations we simultaneously came on an idea, which upon the manufacture of our next model will revolutionize the world! The name of the instrument, RADIOPHOTOSELENICOSCILLATORIOPHONE, is self explanatory. The idea of transmitting a photo or living image via land-line is old and to quite an extent perfected. However, the principles which are applied to such telegraphy must be abandoned when similiar attemps are made by radio. The solution, of sending images thru an application of wireless, was discovered, as above stated, thru joint and exhaustive experiments on the part of Hen and myself. Our principle, briefly, is something on the order of the Goldschmidt Alternator, whereby we stepped up the frequency of our city lighting juice. The main variation from that commendable apparatus was seen in an auxiliary machine which in an entirely different manner reduced the already short wavelengths to those of light. These extremely rapid oscillations were superimposed upon still shorter waves (different degrees of the Ultra Violet), which we employed as carrier wave. The latter were generated by a two-stage application of the general principle. It is obvious that by tuning to the various frequencies of the carrier wave, an analogy to radio is found, and interference from other Radiophotoselenicoscillatoriophone stations would be lessened.

We constructed a number of these machines and loaned one of each to certain amateurs on Washington Heights, giving them full instructions, and arranged, as a practical test, to have them all in operation at a set time on a given evening.

Hen arrived early, bringing me a stock of Bock Panatelas and we commenced tuning our rather complicated receiving apparatus. It might be mentioned that reception was accomplished by an application of the heterodyne idea, and its success on waves of such extreme shortness necessitated the Nth degree of delicacy.

The power company had recently installed our special ten K.W. lines with which we operated our receiving mechanism, and I examined the connections, preparatory to opening up. Suddenly I gave a start.

"For the love of Mike, Hen! You hooked this darn thing up with **annunciator wire!!!**"

"Well it's the only stuff I could find around,—and it'll **announciate** the photos! Hi!"

When Hen starts that foolishness 'tis best to pay him no attention, so I glared my disapproval and continued the investigation.



I reached forward and grasped the hundred amp switch.

Looking at my watch I noted that it lacked but a minute of the time when the prearranged stations would be operating. I reached forward and grasped the hundred-amp switch. 2BH backed away (he always does when he fears something may happen), and I threw in the juice to our four alternators.

As the machines gathered speed I sat transfixed, gazing first at the bell wire, then at the ammeter which was slowly climbing. Ten, twenty, twenty-five, and finally wavered about thirty!

"Wow!" yelled Hen, "That's a regular electric stove—ha—ought to increase our receiving **range.** Ha ha! Get that? **Stove range—he he!!**"

He ducked, but I was too busy to chuck anything his way.

I tuned down to a couple of millionths of a centimeter and the platinum screen before us commenced to glow. Then changing colors it took on the appearance

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of a radio station! The scene varied thru all the hues of the rainbow and continued to be unstable. This was no doubt due to the unsteadiness of this very short wave. However, I made mental note that the still shorter carrier wave was stable.

It worked! Before us was a perfect view of an uptodate radio shack.

As the shade graduated from a bright vermillion to a glaring green Hen could not resist the temptation to remark,

"Hey, Jack, you ought to call this a Chamelionograph!"

I growled ominously and he ceased his childish prattle.

On one side of the set we were regarding was a large gas-range, announcing the fact that the station was situated at no great remoteness from the kitchen. It was easy to recognize the long countenance which glared at the audion before him, so we had no need to recourse to the printed 2ABP on the wall. We centered our attention on thhe operator. He turned uneasily toward the stove which was continuously spattering him and his with the superfluities of frying frankfurters.

"Say", commented Hen, "I'll bet those doggone dogs make some QRM, what say?"

I continued my policy of saying nothing.

The canines in question began to sputter a little wildly and radio operator, Don Plumb, glanced fearfully about for a fire-extinguisher when suddenly the "picture" faded.

I was at a loss to explain this occurence, but Hen brusquely took the key.

"2ABP de 2BH—sa om sum of tt grease spattered on the lens in front of the selenium cells—wipe it off—HI—AR K"

Sure enough, as the picture returned we beheld 2ABP rag in hand. The dogs were then conveyed in the direction of the dining-room and we QSY'd a few thousandths of an centimeter lower.

Another station came into "focus" and we interested ourselves with 2LM. A huge sheaf of radiograms adorned a hook above a one inch spark-coil which was sputtering profusely. An oscillation-transformer lay in discard on a shelf, while a wavemeter reposed permanently in the wastebashet. As the operator was industriously engaged we put on the phones. We were greeted with the last of a long series of 3DH's followed by an extensive array of 2LM's. As I turned off the bulbs Hen muttered, "I thought so!", and we changed scenes.

As I tuned in I lit a Bock Panatela and smoked vigorously to nullify the odor of melted wax which now emanated from my annunciator wire in quantity. The ammeter wended its slow but sure way towards the forty mark!

The image now kaleidoscoped to the compact fone-set of 2AB. We beheld its owner, M. B. Sterns, in a very peculiar position. Tho it was past eight and full time for his concert, he was meandering around the room on hands and knees! He first protruded his head in a waste-paper-basket, then extracting it with difficulty, he crawled about the shack in the most amazing manner!

Hen suddenly left the room, returning a moment later with the telephone book.

"Here you be, Jack; Matteawan one two six eight."



"Sterns just shimmied under the bed!"

"What are you talking about? Come here and watch this. It's good. Sterns just shimmied under the bed!"

"That's just it, you can't let the poor guy suffer like that. Matteawan one two six eight; that's Bellevue; call 'em up and tell 'em to send some men with a van up there!"

I admit 2AB's actions did look rather queer, but averred that we had better await developments, for if sane he might resent such drastic procedure.

Sterns finally emerged feet first from under his bed, a small shiny thing grasped triumphantly in his hand. He rose to his feet and advancing to his phonograph started the show. He had been hunting needles!

I threw the phone book at Hen and tuned in our next station.

What closely resembled a shaving mug took the place of Stern's shack. A thin cloud of steam wavered above this radio montrosity, and flickered green and blue. The "mug" must have been very close to the lens of the apparatus for nought else of the station appeared. Suddenly an enormous hand took the handle, and the cup disappeared disclosing to view a respectable audion control cabinet. The mug re-appeared half emptied of its contents Hen's brow raised and I prepared myself

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for some facetious remark.

"Home brew", he suggested.

The mug repeated the disappearing act and when it again returned the guiding hand held a Mecca cigarette. Light dawned upon me. It was merely 2OK, friend Oscar, and his eternal cup of cocoa! This beverage finally left the scene for good and we gravely watched the maneuvers of the cigarette. 2OK threw in his transmitting switch, sent a few explanatory (?) V's, and placed a book on his key. Having first donned rubber gloves he grasped the coffin nail with a pair of pliers and held it in the spark!!

As Johnson, 2OK, consumes a box of butts per evening, I've sent in my dollar to the National Anti-Tobacco League. It may help to reduce QRM!

Above the operating table stood the redeeming feature of his shack, an A.R.R.L. certificate, heavily framed. Hen noticing this grew excited and dancing on one foot proclaimed,

"Hey, that's a **frame** up—Ha ha he he!"

Hen, with the skill of long experience dodged "Vacuum Tubes in Wireless Communication", which I accompanied with the remark that the pun was the lowest form of humor.

As 2OK commenced to relite his cigarette, I again QSY'd and my last glimpse of his station was of an O.T. in beautiful discard under his desk.

At this juncture, Hen howled as he came in contact with an incandescent bell wire and I cast a mournful glance at the ammeter. FORTY-FIVE amps! MIM!



2QV was likewise condemned to the "galley".

As a couple of wash-tubs "faded" into existence on the photo screen I thought we had returned to 2ABP but the sight of a huge Dubilier condenser disclosed that 2QV was likewise condemned to the "galley".

"Say, his set has a rather **tubby** appearance! Haw haw!" chirped Hen.

I looked threateningly at a copy of "Practical Wireless Telegraphy", and he sobered down.

A mass of machinery operating a break-in-system was the next most ostentatious instrument in the shack. An oscillation transformer stood to the left and I noted the proximity of the primary to its better half. Under the table reposed a Packard transformer and next to it a galvanized garbage-can.

Henry backed to the door and yelled:

"Say these guys who are **stranded** in the kitchen would make good aerials! Haw, haw; get that? **Stranded!**"

I contemplated murder and was seriously considering how I might hook 2BH to the ten K.W. line when a peculiar looking instrument in 2QV's shack attracted my attention. It was a large, well-worn clamp, affixed to the table, just one side of the key. Its use was obvious. When friend DePalma desired to test he merely swung the clamp around 'til the key was closed. It remained there until the termination of the test, incidentally a period of about one half hour. I looked in vain for a time clock operating this unique contrivance, set for about eleven P.M.

I tuned a little closer and the cook-stove came into focus.

"Say", quoted the irrepressible Hen," I'll bet that's a BAKELITE stove, and by the way, with that right next to him he ought to have quite a transmitting **range**! Haw he ——————!!"

I threw everything within reach and as Hen jumped he slipped in a pool of molten wax, which, since eight o'clock, had been accumulating in puddles beneath the annunciator wire. As he fell, he grabbed my light extension. My last impression before the wire snapped and darkness prevailed was the scale of the ammeter. Fifty-six amps!

The glowing bell wire sparked fitfully in the dark. A little ball of white formed on one and quickly enlarging dropped to the floor in a blinding display of pyrotechnics. The alternators, with a final whine, came to a standstill and the fused wire cooled to a dull red.

NOTICE

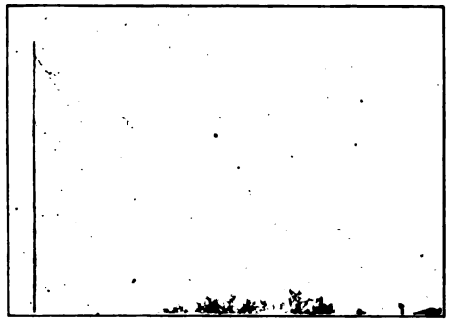
On Tuesday and Thursday nights during October, between 10 and 11 p.m. Eastern Standard Time, the A.R.R.L. will conduct another series of Fading Tests for the Bureau of Standards. Stations in northeastern quarter of country will be engaged in recording—details later. All stations are requested to confine their transmitting to a minimum during these periods, to prevent interfering with the recording.

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Concerning Cages

By Sumner B. Young, 1AE

CAGE antennae are seldom used by amateurs because their merits are not popularly known, and because a flat-top aerial of conventional design is easier and cheaper to erect. However, the cage has electrical and mechanical advantages which should make it popular with Relayers who desire extreme ranges, and it should prove valuable where space to erect an aerial is limited, or where high winds must be withstood. Anybody can build a cage; care and patience are alone essential.



4-wire cage used at 1AE Mar. 20—June 24, 1920.

It is generally conceded that the flat-top has electrical shortcomings. Radio frequency currents traversing it flow mostly in the two outside wires, just as these currents would tend to run along the edges of a flat copper ribbon. The losses incurred are small, but they are of importance where excellence is sought. Sway-guys, which must be fastened to the ends of the spreaders, not only add weight, but more losses, for they offer four possible leakage paths to earth, blocked only by insulation which is never absolute.

Still more obvious are disadvantages of a mechanical nature. The spreaders of a large transmitting aerial are long and heavy, yet they add nothing to the electrical capacity of the antenna, and are always a menace, for they offer considerable surface to wind and sleet. Their contribution to the insulation scheme is negligible.

The circular shape of the cage is advantageous. Due to it, every wire gets its proper share of the load when high frequency currents are flowing through the cage. The heavy metal rings not only help to maintain this equal current distribution, but also increase the electrical capacity of the antenna system. Furthermore, long lead-ins may often be avoided, for the cage takes up little space and can be brought closer to the operating room. Sway-guys are eliminated, for the wind whistles through a cage instead of tossing it around.

The diagrams give specifications for a cage well suited to amateur requirements. In building it, the following procedure can be followed to advantage:

1. Bend the rings to shape by hammering them around a circle of heavy spikes driven into a wooden framework shaped like the spokes of a wheel. Wrap the joints and solder.
2. With a file mark the places on the rings where the aerial wires are to be fastened.
3. Cut the aerial wires to proper lengths, allowing a few extra feet, and coil them separately.
4. Solder one end of each aerial wire to the first ring.
5. Select a clear spot in the back yard. Fasten this ring securely to the side of the house so that it will remain in a vertical position and will not slide around even if considerable pull is exerted on it.
6. About 65 feet away, set up a post, and fasten to it a large board parallel to the side of the house to which the ring is fastened. Draw a two-foot circle on this board, and drive screweyes into it, spacing them sixty degrees apart around the circumference.



10-wire cage to be used at 1AE this winter.

7. Uncoil the antenna wires, fasten the free ends to the proper screweyes, and adjust to equal tension.
8. Tie in the rings, using short lengths of #16 bare copper wire.
9. Solder the tieing-in wires to the aerial wires and to the rings. Use jumpers

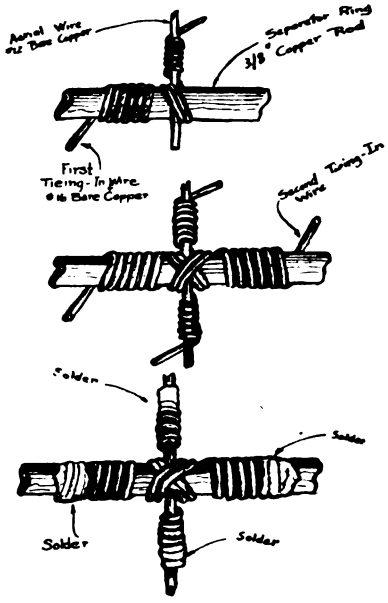
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where good electrical connection is doubtful. Apply the solder at the ENDS of the tieing-in wires so that the aerial wires will not be stiffened where they meet the rings, and rendered liable to breakage.

This soldering takes time and care for the rings absorb a great deal of heat. A soldering-iron weighing at least three pounds must be used.

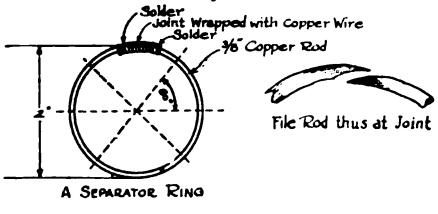
The cost of the cage described above will be about fifteen dollars. This figure can be greatly reduced by using galvanized iron instead of copper separator rings. However, iron is heavier, and the joints between the wires and the rings are somewhat subject to corrosion. Wooden separators such as bicycle rims and cross-arm arrangements will serve, but they are cumbersome, and put the cage at the mercy of the wind. They do not become part of the aerial itself, nor do they assist in distributing current equally between the wires of the cage.

If possible, install the cage so that a long lead-in is unnecessary. If this cannot be done, it will pay to build a miniature cage about six inches in diameter to take its place. Cables are poor radiators, and often poor conductors. It is significant that the down leads from the flat-top to the outdoor tuning inductances of the Alexanderson multiple-tuned antenna at



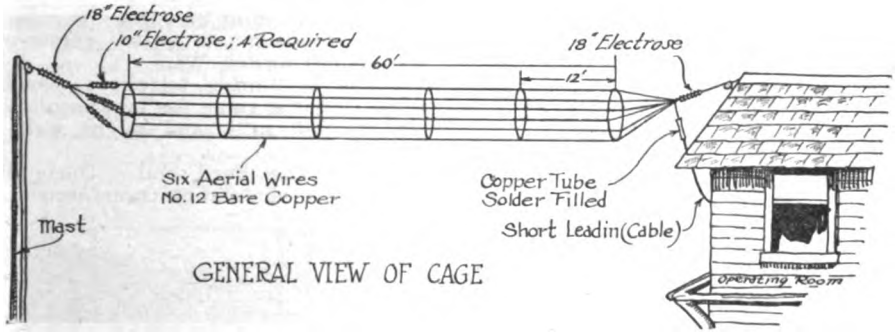
Marion, Mass., are cages, and it is presumed that this construction is duplicated at other high-powered stations of the Radio Corporation of America.

The photographs show two cages which



A Separator Ring

were built by the author and used at 1AE. The smaller consists of four wires 55 feet long, and has galvanized iron rings 18 inches in diameter. This was in service from March 28th, 1920, until the station was closed for the summer on the 24th of June. A conservative estimate, based on our Log Book, is that it added 100 miles to the station's range. The other cage is of equal length, but has ten #14 wires spaced 36 degrees apart around three-foot copper rings. It received its initial tests on August 23rd, and a 10% increase in the reading of the hot wire meter noted. This cage was built in two sections which were joined together after they had been hoisted to the roof.



GENERAL VIEW OF CAGE

During the coming season, the author's business will keep him away from home a great deal, yet he hopes to "sit in" Saturdays and keep folks from forgetting the sound of his spark. Perhaps "The Old Man" will call him some night and describe a cage he has invented to shut up the radio pests he rants at.

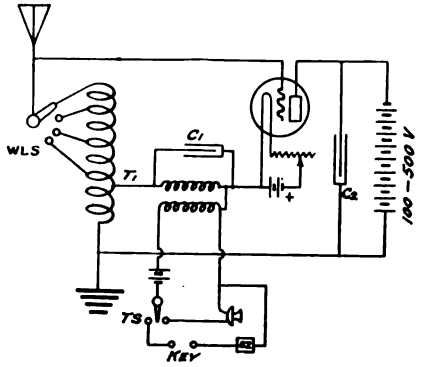
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A Simple Radiophone Operating On "B" Batteries

By F. S. Huddy, 1II

THE following is a description of my wireless telephone outfit. Enough data are given to make it easy for the average experimenter to make and work it. Many improvements will at once suggest themselves to the person constructing the outfit. Let it be said here that it is not a high-powered set. It will not send 1000 miles on 5 watts and is not meant for long distance traffic. It is, however, easily made and with 100 volts on the plate will transmit 5 miles with a good antenna. The type of tube to be used is left to the judgment of the maker. The writer is using a Western Electric VT-1—a receiving bulb.

Various tubes have been used. Almost any tube that will oscillate with 50 volts on the plate will do. The Marconi class II tubes work fine if the voltage of 500 is obtainable. As every experimenter has

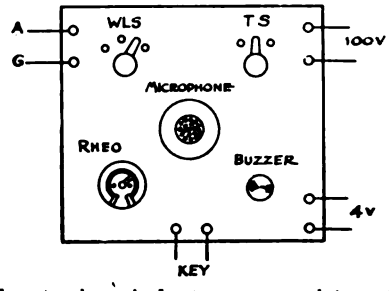


not this voltage at his disposal, the W. E. or Audiotron is more practical as they will oscillate and radiate at a much lower voltage.

The following materials will be needed:

1—11 ohm battery rheostat
1 local battery 'phone transmitter
1 large rotary switch
1 small rotary switch
1 high frequency buzzer
1 knife switch
1 Ford spark coil
1 2-mfd. telephone condenser
1 VT socket
1 wood or bakelite panel 12" x 12"
6 switch points
8 binding posts
1 lb. bell wire
1 condenser, .005 mfd. or variable

A glance at the drawings will show how the instruments are mounted. The small switch to the right of the microphone changes from buzzer to talking circuit, and in its center position opens the battery circuit. A key is connected to the binding posts in the lower right hand corner of the panel. By shortening the buzzer and connecting a long flexible cord to the key binding posts, an extension microphone may be connected in, which is convenient to place in front of a phonograph.



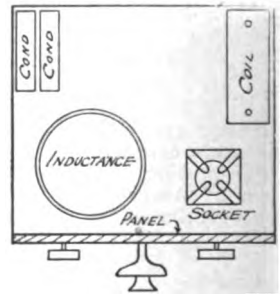
The tuning inductance consists of 53 turns of No. 18 bell wire wound on a tube 5¼ inches in diameter.

Starting from the bottom, taps are taken at 20, 39, 43, 48, and 53 turns. T_1 is the tap taken at 20 turns.

The others run to switch points of the wavelength switch WLS.

C_2 is a 2-mfd. telephone condenser, while C_1 has a value for best results in my set of .005 mfd. and might well be a variable.

MT is the Ford coil. Uncle Henry makes good modulation transformers. The



one I used transmitted the speech perfectly and without distortion. Switch TS is used to change from the microfone to the buzzer.

The buzzer is connected in series with the battery and key.

Anyone interested in the construction of this little outfit and who does not understand my description, is invited to write me at my residence at No. 204 Bowen St., Providence, R. I.

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An Oil-Dielectric Transmitting Condenser

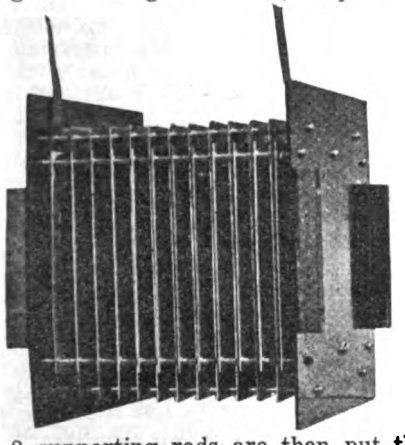
By L. A. Bartholomew, 6LC.

HERE is some firsthand dope on a condenser that will not "blow" when needed most. It is of the oil dielectric type, quite simple to construct; but expensive, as everybody finds out who makes any kind of a transmitting condenser. This one takes 70,000 volts to puncture; that is, the condenser will puncture if the voltage is allowed to build up to that figure. This does no harm whatever. A bubble rises to the top, and the condenser is ready for the next shot. The losses, also, are very small.

The material needed:

2 Bakelite end pieces, ⅛" x 14" x 14".
38 Aluminum plates, No. 16 gauge, 10" x 13".
152 Spacers, round brass tubing, ¼" O.D. and $\frac{3}{16}$" I.D., $1\frac{1}{8}$" long.
8 Spacers, ditto except ⅜" long.
8 Round Brass Rods, $\frac{5}{32}$" diam., $21\frac{1}{2}$" long, threaded 8-32 for 1½" on each end.
16 Hex. Nuts, 8-32, and washers.
Tank and Oil.

The Bakelite end pieces carry the eight rods, on which, separated accurately by the spacers, the aluminum plates are mounted in two sets, the longest dimension of alternate plates being at right angles. The drilling of the plates and the end pieces is the first step, and the dimensions are given in Fig. 1 and 2, respectively.



The 8 supporting rods are then put thru one end-piece, with washers and nuts behind, and the piece laid flat on the bench with the rods in a vertical position. Put short spacers on one set of four rods, and long spacers on the other set of four rods. Put on two plates (automatically at right angles to each other), and then another set of spacers, this time long ones on all 8 rods. Then another set of plates, etc. When half the plates are on, connect on the terminals to the center plates, which is done to make the current path as short as possible. These terminals should be at least 1 inch in width, and preferably 2 inches. Then put on the rest of the plates, finishing with the remaining set of short

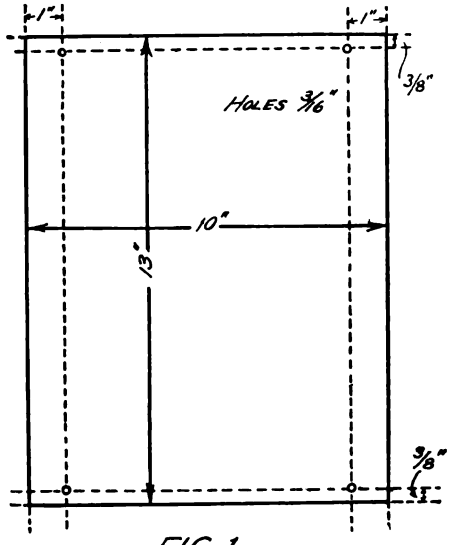


FIG. 1

spacers, and finally the other end piece. Fasten the ends with hexagon nuts, and draw up tight.

Make a tank of galvanized iron and put the whole affair in. Fill with Mineral Seal or any good high-flash transformer oil. Above all things, use heavy metal for the plates—No. 16 gauge aluminum is the best. I used scrap stuff, which was very low in price—the new stuff is expensive. These plates must be spaced at least ¼" apart, and $\frac{5}{16}$" is better. This design gives $\frac{5}{16}$" spacing. Use oil perfectly free from moisture, and let the condenser stand at least 24 hours before using, to let the air bubbles rise.

In drilling the plates, stack 19 plates in each stack and clamp to the bench in any convenient manner, and drill the four holes right thru the pile. This insures alignment. A $\frac{3}{16}$" hole is about right. Place one plate of each pile on a Bakelite end piece in the same way they will be when assembled, and drill the end pieces thru the holes in the plates, using them as templates.

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The dielectric constant of Transil oil is about 2.1, so it takes quite a large condenser to get any great capacity. The value of the condenser here described is about .007 mfds. A photograph of a similar condenser is shown, but having but 25 plates, 8" x 10", and a capacity of about .003 mfd., being designed for high voltage and high tone. With it I get 9 amperes in the aerial with a 1200-per-sec. spark rate, and on 600 per sec. and less power, 6 amps. The larger condenser here described (38 plates— 007 mfd) is in use at 6ER, where the antenna current is 9 amperes on 1 KW at a spark frequency of 500 per sec The best 6ER could do with a glass condenser was about 6 amps. 6HS and 6PI are also using the oil type of condenser.

I hope that this information will help any amateur who is having trouble with condensers that "blow".

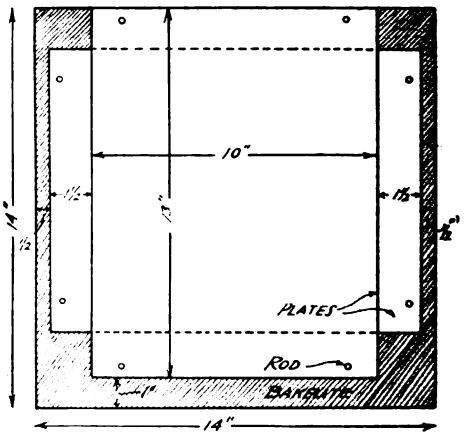


FIG. 2.

A Paper on QRM

By John F. Gray, 6MZ

Presented before the Sunset Radio Club, San Diego, Cal.

We hail this article as the best we have ever seen on this important topic. It is a most vital one, to clubs and individuals alike. We have talked much of co-operation, and we reiterate that it alone can lessen our difficulties. In this splendid paper Mr. Gray defines the practical methods in which this co-operation can be applied. With all the earnestness there is in us, we commend these principles to the individual amateurs of the country.—Editor.

OUT of any hundred radio club meetings, or out of any hundred issues of radio magazines, you will find it hard to find a meeting or an issue that does not contain some discussion of the QRM question. And no matter how much we talk or write about it, the QRM situation seems to stay pretty much the same.

All radio communication is more or less affected by interference, but the situation is particularly bad in amateur work. When you come to think about it, this is not so very surprising. Nobody expects very good service out of a six-party telephone. So why should we expect to talk to whomever we please, whenever we please, on the several-hundred-party-line of two hundred meters? When you look at it that way, I sometimes wonder that we ever succeed in talking to each other at all.

You cannot hope to do away with QRM so long as radio apparatus of anything like the present type continues to be used—that is, you cannot hope to do away with it unless you are going to restrict the use of the air to two stations a night, two stations an hour, or something on that order. All you can hope to do is to try to hold down unnecessary and avoidable interference to the point where a fellow doesn't feel like breaking up his set with an axe and taking to drink—if there were any drink to take to. That's what I am trying to get at here, but just how far I shall get remains to be seen.

As heard from 6MZ, the San Diego District seems particularly fortunate in this matter. This may be partly because we are out of the range of the spark coils, but I do not think it is entirely so. for the stations we work in town are able to copy us pretty much any time they answer a call You fellows in town may think the situation is bad, but San Diego cannot be put in the same class with Los Angeles, where some suburban stations are not able to reach town through the QRM barrage for weeks at a time. It is said to be even worse in some of the eastern cities.

All the same, whether we are to be considered good or bad as cities run, there is no doubt that we can stand a lot of improvement.

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There are any number of classes of QRM. There is the hard boiled kind—the fellow who hogs the whole air whenever he has a mind to, and thinks QRT was invented just to make him laugh. I have never heard him in the San Diego air, I am glad to say, but if he ever is heard we all know what to do with him—turn him in to the radio inspector—do it quick, and don't mince words about it. I wish the rest of the classes were as easy to deal with as he is.

And there is the bone-head kind. He isn't quite as easy to deal with as the hard boiled because the poor fellow was born that way; he may mean all right but he just could not help it. When you bawl him out, he feels awfully bad about it usually, apologizes all over the place, promises never again—and then goes right back and goes at it just as bad as ever. His specialty is calling without listening for more than thirty seconds or, even worse, just throwing in his switch and pounding away on the key without ever bothering to listen at all. It never seems to get into his brain that it takes at least three minutes to really find out if the air is clear. He doesn't realize that the station he is calling may be copying someone whom he, himself, cannot hear at all; or if he does hear him he does not realize that the station he wants to call is the one that is being worked, because he does not have the sense to wait to hear a few call letters and learn who is working whom. He has other specialties in the same class but that is the worst one. San Diego is free from him, but I hear him once in a while. A little more listening would save a lot of wasted juice and a lot of hard feelings too.

Mr. Kruse's Paper on the Bureau of Standards—A.R.R.L. Fading Tests unfortunately could not be made ready for publication in this issue. Watch for it IN THE NEXT ISSUE.

Then there is the fellow whose speed limit for receiving is about three words a minute. You tell him QRT, QRW, QRX please, and he comes right back at you with "Your signals are fine and strong, old man—I have put my coupling two inches closer, how do I come in now?" All spelled out without a single abbreviation. More often than not he is ashamed of his bad copying and will not let on what the trouble is when you are talking to him. There is no crime in asking for QRS, but this fellow would rather let you QTA till you get a sore arm, or until you finally do discover his secret and hand him the code at a speed where he can take it in.

On the other hand, there is the high speed artist and the fancy fist fiend, or both combined in one. There is a fellow near San Diego (he is not a member of the Club, though) who sends a hash of dots and dashes that sometimes could not be read by the best operator licensed. Being used to it, I can make a pretty good job of copying him on his good days, and I often get a lot of fun out of listening to him chewing the fat with some poor guy who is hearing him for the first time. If it was not for the call letters you would never know they were talking to each other, as neither of them are saying anything to do with what the other has just said. This sort of thing is not QRM itself, but it is the cause of a whole lot of it because it ties up the air with a lot of stuff that might as well go unsaid, or if they are trying to say something that requires an answer, it causes one or more QTA's that need never have been given.

And we have the station with the wave like a barn door that comes in equally well anywhere you want to tune your receiver. There are a number of them in San Diego, in fact they are about the only serious cause of complaint that there is here. Theoretically every amateur station, or nearly every one, is tuned on two hundred meters. Practically there is enough variation between most stations to enable fairly successful tuning out of interference, provided the interfering stations have sharp waves. You cannot tune out a broad wave because it comes in just as well one place as it does another. If one transmitter is tuned to a hundred and ninety-five meters, and transmits a wave of that length only, and another transmitter is tuned to two hundred meters, and transmits a wave of that length only, you can tune your receiver to hear only one of them, if it is selective enough. But if one of these transmitters has just as strong a wave on one hundred and ninety-five meters as it does on two hundred there is no way for it to be tuned out, and the other station still heard.

Some time ago I tuned in a report to the chairman of the QRM committee on the subject of broad waves. The report had scarcely been mailed before the two stations most complained of had changed their broad waves to exceedingly sharp ones, and a station that I had given a fine boost went and came out with a wave that was QSA through one hundred and eighty degrees of the series condenser. What I am driving at is that it is hard to lodge a complaint against any particular station, because we amateurs fool with our sets so much that what is the truth about somebody's wave one week will be the reverse

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the next. There is a station in town that is pretty sharp right now, but two or three weeks ago I copied him QRK on two thousand meters, believe it or not as you like. It took a pretty close coupling to get him but he came in all right.

All that can be asked is that we bear in mind to keep our quenching good and our couplings loose. Just because the hot wire ammeter reads higher, the closer you put the coupling, is too much temptation for some fellows—they reason that the more amperes they radiate the more noise they must make in the air. They do not or will not realize that the high ammeter reading given by close coupling simply means that they are radiating a whole lot of different waves no one of which is of any great power, but the sum of all of them makes the wire in the ammeter fine and hot. They are getting the amperes into the aerial all right but it does not mean anything because they are throwing them away in waves they do not want. Keep your coupling loose enough for there to be just one wave radiated and what energy does get into the aerial will be concentrated in one wave, not spread out all over the air causing nothing but QRM.

As to quenching. I notice that a good many of the fellows are making the discovery that the lower their spark rate is the more energy they can get into their ammeter. That is all right as far as it goes but some of them are going at it the wrong way. When they want a lower spark frequency they simply slow down their gap motors. This will get by for an experiment but it does not get by as a permanent proposition. Remember that the first duty of your rotary gap is to quench the oscillations in your primary circuit and to open this circuit so that it will not absorb back the oscillations in the aerial circuit. Just giving a high spark rate and a musical note is not the main purpose of the rotary. Once two or three oscillations have been given to the aerial circuit, the usefulness of the primary circuit is ended and you want to get rid of it—to quench it as soon as possible. So, when you have decided on the spark rate that gives the best radiation, and that gives the tone that suits your taste best, the thing to do is to speed up the motor again for all it will take and cut down the number of electrodes in the motor to the number that will give the frequency you are after. There is no such thing as too high speed for a gap motor.

Another thing that causes a lot of trouble is the use of full power for talking to a man in the same town. There used to be a great deal of this in San Diego although the fellows are learning better ways now. A number of times I have had to give up trying to get radiograms from the north for the rest of the evening just because some amateurs in town were talking about the weather or kidding each other about their girls on full one-half K.W. When you want to chew the fat with the man in the next block cut down the input with a magnetic shunt or a rheostat to the point where he can just get you QRK. Or if you haven't got either of these loosen up the coupling to get the same result. A hinged oscillation transformer is a help in this method, and if a little QRM spoils the reception of the man in the next block do not begin to lose your temper and give her full power. It does not hurt to QTA, "Did it rain much over your way tonight?"

In talking about spark frequency there is one thing I might have added. Although there is not much doubt that a low tone gives better results on two hundred meters in most cases, this is not always so and it seems too bad that everyone in San Diego is taking up a low note. When stations have widely differing tones it is possible to do some selective tuning by what is called the group frequency method, by a variable condenser across the phones. And even if you cannot tune one out it is still fairly easy to read either a high or a low tone transmitter even when both are coming in at the same signal strength. The fellow who is content to stick with a high tone may not be able to break all the long distance records but he will be able to get his messages through most ordinary QRM, and day in and day out that is what you are trying to do. Average amateur work is down within a radius of a hundred miles or less.

One thing that can be given attention is the habit that some men have of making a string of unnecessary signals. One KA is what the law requires, three or four KA's are a violation of the law as well as a waste of valuable time. And when you have once established communication with a station there is no need of calling him the three full times, unless some exceptional condition makes it necessary. The same thing applies to calling a very near-by station, when you are fairly certain that he is on duty. Try him with a single call first and if that does not raise him the three repetitions can be used. And do not fill up the body of the message with a bunch of periods, dashes, and HI's. That does not mean to leave them out altogether if you like to use them but it does mean not to put them between every other word the way some operators do. Also I see no reason for signing off with your call letters at the end of every message. The man you are talking to knows who you are and as long as you are QRW it is nobody's business. When you give your sign-off with the SK, it means something because it tells men who are standing by what stations are clear for new business.

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This about covers the matter of the QRM that we can all get together to stop in our every day sending. It leaves two big questions that are now being considered by nearly every radio club in the country as well as by the American Radio Relay League itself.

One is the question of different classes of amateur wave lengths. And one is the question of a division of the time for Relay League messages. They are both subjects which should be seriously considered but I think it is better that they should be freely discussed by the Club at some time rather than be gone into at great length in a paper.

There are two general classes of amateur stations: those that by reason of their low power do most of their communication within a radius of twenty-five or fifty miles or less, and those from a quarter to one K.W. that do inter-city and genuine long distance work. The big fellows need every bit of two hundred meters both because a longer wave length carries further, and because they need as much condenser as possible to use the power available. The smaller fellows cannot by any chance work much over fifty miles or so, nor can they use .007 or .01 microfarads. They use the two hundred meter wave mainly because the law allows them to and not for any particular good that they get out of it. They would do exactly as well on a hundred and fifty meters, in fact they would do even better because they would be able to keep on working when a high power station in the same town was transmitting, and not be drowned out as they are now. At the same time the QRM for the larger transmitters would be reduced by one-half or even more. I cannot see that such an assignment of wave lengths would do anybody any harm. Of course we would not expect the law to be changed or anything like that but it does seem that some agreement would be arrived at among the members of the clubs, between the various nearby clubs, and possibly throughout the whole country, by which some such assignment of wave lengths could be brought about. Let's think it over.

Then as to the division of time for Relay League work. I am one of those people who believe that the biggest thing in amateur radio is the handling of messages. It is the most instructive part of amateur work—in the long run it is the most interesting, and it is certainly our very best advertisement.

When a man is a really good League operator he is fully trained to be a first grade commercial operator, if ever he should want to be one. In fact in most commercial work where they have cast-iron rules about unnecessary signals and conversations, not to speak of their high power sets, it is easy sailing compared to amateur relaying. To see the way a good relay station gets its messages off the pin in the face of all the difficulties with which we have to contend would make a commercial sit up and take notice. If it had not been for the training furnished by relay work, the country would have been hard up for radio operators in the war.

Then again—sooner or later a fellow gets tired of just chewing fat with anyone who will answer a CQ. When you know all about the sets of everybody to whom you talk and when they have heard all about yours, you begin to wonder what to talk about next. I am not trying to say that it is not good fun to pass the time of day with somebody in the next town or in the next block for that matter, for if we all felt that way about it we might as well join the Marconi service and get it over with. All I do mean is that we need something to keep us on the job and to keep up our interest. Relay work furnishes just this.

As to advertisement for amateur radio, about the only way we can keep the public informed that we exist and that we are doing serious and valuable work in the art of radio communication is by furnishing a sure-shot relay service,—not child's play, but something on a par with the commercial companies. And if we want to stay in existence we shall need every bit of advertising we can get. Every time they talk about a new radio act in Washington, it means danger for the amateurs.

When a station has a message to handle he should have the right to ask any station who is simply conversing to QRT, and what is more that station ought to be made to do it. There should be one, or better, two periods per day set aside for the exclusive handling of relay messages. To avoid confusion, certain stations should be designated to do relay work in regular order, two at a time, one to handle traffic and one to stand by to help if necessary. If we do something like this we shall be able to clear all San Diego traffic, North and South, in at most two hours out of the twenty-four. As it is now, San Diego is on the black list of the Pacific Coast Manager of the A.R.R.L. as having rotten service. * As it should be, situated as we are, we should have the best service on the Coast.

To make such an arrangement worth while we should have an agreement with the Los Angeles club so that they can receive our traffic when we are ready to send, and so that we can do the same for them. I am sure they would be glad to do something along this line.

* San Diego was on the black list perhaps, but it is no longer. The co-operation there is most admirable now, and we know they have a hard struggle working through NPL's arc. —Editor.

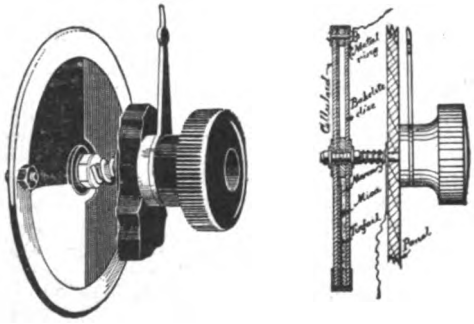
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A New Variable of Radical Design

THE Parkin Mfg. Co. have developed a new type of variable condenser of radical and interesting design, which is the most compact, practical, variable condenser that we have seen. It has a maximum capacity of .001 mfd., and the size of the unit is only 3" diameter by ⅛" thick.

Some of the advantages claimed for this condenser are that it has a lower minimum capacity than the average air condenser, as the large number of plates in proximity to each other in the zero position have been eliminated; it is practically unbreakable, there being no plates to get bent and short circuited; it is absolutely balanced, and requires only one hole in the panel for mounting.

Another great advantage is that two or



more units may be mounted on the same shaft, giving a proportionally higher capacity while taking up hardly any more space.

From the sectional drawing illustrating the construction it will be noted that three discs are used, one of fibre, one of mica, and one of celluloid, the mica disc being in the middle. Between the celluloid and mica disc there is a semi-circular tinfoil plate which forms one of the condenser plates. The fibre and mica discs are separated ⅛", at the periphery by a soft rubber insulating washer, and at the centre by a metal washer which also serves to make contact with the mercury with which the lower half of the space is filled. A brass eye fastens all the discs together at the centre and makes contact with the metal washer. A metal ring fastens the discs together at the periphery and makes contact with the tinfoil plate. This ring is clamped on with a pressure of five tons making the escape of the mercury impossible.

Connection is made from one side of the circuit to a soldering lug on the shaft, and from the other side, by a flexible wire, to the terminal on the ring provided for this purpose. If preferred this contact may be made by a strip of spring brass mounted on the back of the panel and bearing against the ring.

From the above it will be clear that the tinfoil plate constitutes one of the condenser plates, the other plate comprising the body of mercury confined in the chamber between the mica dielectric disc and the fibre housing disc.

Since the weight of the mercury causes it to always remain in the lower half of its chamber, that is, in a substantially stationary position, while the tinfoil plate will rotate with the condenser, it follows that by the rotation of the instrument the semi-circular tinfoil plate may be brought into full or partial registration with the fixed semi-circular mercury plate or placed completely out of registration with it, thus varying the capacity of the condenser in accordance with the areas in register.

The transparent celluloid cover allows the operation of the condenser to be seen, and facilitates the original setting in the zero position.

These condensers, the manufacturers state, after having been thrown around a room, have been tested out and found to function perfectly.

They should fill the long-felt want for a rugged, low priced variable condenser.

THE DIRECTORY OF CALLS

THE long-looked-for Department of Commerce's List of Radio Stations of the United States is now promised for delivery early in October, and QST is therefore omitting the two pages of calls which have been appearing each month, as they would be calls contained in the government list in all probability. As soon as this list appears we will resume, taking up the lists where the Government edition stops.

The new list is to be published in two parts this year: one part to contain government, commercial, and special stations, and the other the amateur stations. The sale price cannot be determined until the cost of publication is known, but it is expected that the figure will not exceed fifteen cents for each list, possibly but ten cents for the amateur list.

Remittances for these lists should be sent to the Superintendent of Documents, Government Printing Office, Washington, D. C. Let us take this opportunity to say that that is also the correct address from which to obtain copies of the Radio Laws and Regulations of the United States (containing the list of "Q" abbreviations), the price of which is fifteen cents.

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The Chicago Convention

AMATEUR Radio saw its high water mark at Chicago on September 2, 3 and 4, 1920, when the Central Division held its first Convention. It was strictly an A.R.R.L. affair given by the Ravenswood Radio Association, South Side Radio Association and the Progressive Radio Association of Chicago in true A.R.R.L. style. From the meeting of visitors at the different railroad stations with automobiles, to the taking them back to the stations, everything moved with that snap and precision which is characteristic of the energetic mid-west. It was impossible to determine the number of amateurs present on the three different days, but between three and four hundred is a fair guess.

It was a great treat to see the different fellows, with their call letters and their names on the blue and gold badges. Most of them we all hear in the air here in the eastern half of the country. They looked very different than we expected, as is always the case. Locomotive engineers, telephone experts, electric light men, Catholic priests, insurance men, business men and students were among the interesting personnel. Their ages impressed us also. Mr. Bookwalter, who came up from Springfield, Ohio, was a young enthusiast of eighty-four summers, and 9CP, whose examination papers at the Radio Inspector's office are kept on exhibit as an example of a perfect examination paper, was in short trousers and boasted of fourteen summers. They were everything in between and the great average seemed to be around twenty-four.

At the meetings, of which there were three, as reported elsewhere in this issue, it was also a great treat to hear the views of the different fellows whose names are so well known to us. The peppy spirit of general co-operation as voiced by residents of the First, Second, Third, Fourth, Fifth, Eighth and Ninth Radio Districts made one feel that we were actually the one big family we talk about in our QST, and the Technical meetings made it very plain that we certainly have the identical problems on our minds, no matter where we live. The Fellowship Meeting, the final effort, was an exhibition of that curious brotherly spirit that animates us amateurs. The "stunts" that Brother Mathews pulled off made the banquet partake of the qualities of a big friendly party, where everybody simply loosened up and had a jolly good time. We know we did and we are willing to make it a pretty big red apple that everybody else did also.

The Convention out-convented anything yet pulled off in Amateur Radio, and the rest of the country is under obligations to the fellows in the Central Division for setting the standard of what can be done and giving us a living illustration of the magnitudes involved in our A.R.R.L. We lift our hats to you, Mr. Mathews, Manager of the Central Division and leader of this greatest of all Amateur Radio Conventions, Mr. Schnell, Chairman of the Executive Council of the three Radio Clubs, and Radio Inspector Kolster of the Ninth District, Chairman of the Trial Board of the Executive Council and all around good friend of the Amateur. We hope you will try your hands next year and we look forward with the greatest pleasure to being present.

An Anniversary

A year ago this month, thru concerted amateur effort, the wartime restrictions on amateur transmission were removed and we amateurs picked up the threads of our operation where we had dropped them to go into uniform. A year ago we were a band of young hopefuls, dusting off old apparatus because it was close at hand, eager to get on the air but brimful of service-gained ideas, and filled with the resolution that Amateur Radio should be made a greater thing than ever before. How well those dreams have been realized! What vast progress in our activities this one tiny year has seen!

Our relaying network has been built up to a better-operating machine than ever before; the quality of our stations as judged by their performance is incom-

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parably superior; we have played a prominent part in the effort to determine the cause of the elusive QSS; one of our number has been heard in Hawaii and almost every other amateur record has been repeatedly smashed; we have held a number of the most enthusiastically successful conventions; we of the A.R.R.L. have been officially recognized by several departments of our government as the Amateur Standard-Bearer; and, perhaps greatest of all, we have witnessed the introduction of Amateur Vacuum Tube Transmission. A marvelous year it has been. And the future? Gentlemen, we have repeatedly declined to prophesy anything connected with amateur affairs, for things happen much too swiftly with us amateurs to make it safe. We do not hesitate to venture, however, that the achievements of the coming winter will make last "season" look like the vacuum in an audion, which is our idea of nothing. Coast to coast? Why not? The Azores? Who can say? Great improvements in our equipment and methods—new developments? Unquestionably!

It's a great year for us which is now opening up, fellows. Get the old junk in shape and give 'er the juice—the gang is on the air.

Romance

SOME of the old timers complain that there is no romance in tube transmission—it has no individuality or traditional associations like the old spark, they say. Right they are, to a certain extent—the tube work is new, most buzzer notes sound alike, and indeed there is a certain stalwart and hearty attraction about the old nonsink rotary, noisy and inefficient as it is. We have had them with us for years; all our good work has been with them, and there is romance in their wailing old note. But we do believe that they will have to give way to the more efficient tube set, and it seems to us that the talk of romance is merely the last argument of the dwindling members of the Old Guard. As for Romance, what can equal the Romance of getting something out of these little bulbs that have nothing in them?

Our Advisory Technical Committee

THIS Fall will see the launching of our Board of Direction's "Technical Committee" idea. Our President, it may be remembered, was requested by the Board to invite certain gentlemen to become members of an A.R.R.L. Advisory Technical Committee. These gentlemen were the leading radio engineers of the country and of Amateur Radio. They signified their pleasure in accepting the invitation and at the last meeting of the Board in New York their functions were discussed and decided upon. They will be supplied with certain data and their interpretation of this in terms applicable to amateur radio engineering will be requested. In time all of the great problems at which we now must guess or at most proceed into by purely empirical methods, we hope to see put down in precise and exact form and the laws that govern them we shall expect to have set forth. We shall make it a point to see that the language and methods employed are clear and distinct and susceptible of practical use by the average well informed amateur. We expect great results. We all know how we would like real authoritative advice on many of our problems. This plan of our Board of Direction aims to get this advice, and incidentally to elevate the technical standards of Amateur Radio generally. More later, on this interesting subject.

Canadian Relaying

SHORTLY before the summer strays got really bad, regular communication between Canadian and United States amateurs was just getting into its stride for the first time. Reports from Detroit and Buffalo show that the Canadians were being heard well there, and in the St. Lawrence Division Montreal was QSO 8BB and 2TF, and Farnham (Quebec) was occasionally working 1FV and 1HAA.

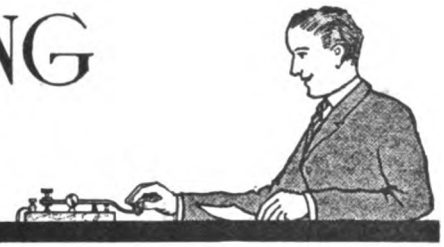
With the coming of summer navigation in the St. Lawrence Valley, the Canadian amateurs reverted to their original 50 meters—which is perhaps just as well this first summer, for they will come back with renewed vim when the longer wave length is again permitted this winter, and then we shall see the result of the pioneering of the past late spring. The outlook for the regular handling of Canadian traffic is most encouraging; the Canadians are now busy getting their sets in shape, and we expect to see all our hopes for international relaying realized this coming winter.



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THE OPERATING DEPARTMENT

J. O. SMITH
Rockville Centre, L. I.
TRAFFIC MANAGER.



AS this is being written the turning point in amateur radio has been reached and the great increase in activity incident to the coming of cooler weather has begun.

The past summer marked a new era in our affairs. Never before had we consistently tried summer operation, and in the effort to maintain communication through strays and summer absorption many of our stations were increased to an efficiency which would not otherwise have been obtained. Many new DX sparks are heard on the air, as a result of this same summer persistency.

The reports show that in every territory strays are decreasing and interest is higher than ever before. Our organization is in excellent condition and we are well equipped as we now enter what will doubtless be the greatest winter Amateur Radio has ever known.

The reports in detatil follow:

NEW ENGLAND DIVISION
Guy R. Entwistle, Manager

Two new assignments have been made in this division. Philip F. Robinson, 149 Hollis Avenue, Braintree, Mass., has been appointed Assistant Division Manager and Leon G. Pollard of 194 South Willard Street, Burlington, Vt., has been appointed District Superintendent of Northern Vermont. 1CK is well known in the first district as an efficient relay man, being an important link in the trunk line through New England. Pollard undertakes a real proposition in developing virgin territory in his section. He will also have the Canadian situation to handle. He reports the University of Vermont as ready to help out with relay work this Fall.

Below is a reorganization outline of the division:

Manager, G. R. Entwistle, 18 Boylston Street, Boston, Mass., 1AL.

Asst. D. M., Northern Section. H. W. Castner, 15 Temple Street, Portland, Maine. 1UQ.

D. S., D. F. Alexander, 209 Elm Street, Bangor, Maine, 1BK.

D. S., A. Ralph Tabbot, 1OA Bar Harbor, Me.

D. S., Dartmouth Wireless Club, Hanover, N. H., 1YB.

D. S., Leon G. Pollard, 194 South Willard Street, Burlington, Vt.

This section adjoins Canada and will look after connections with our Canadian brothers.

Assistant District Manager, Philip F. Robinson, 149 Hollis Avenue, Braintree, Mass., 1CK.

D. S., Henry R. McLean, 342 Union Avenue, Laconia, N. H., 1CM.

D. S., Lee A. Bates, 8 Moen Street, Worcester, Mass., 1GY.

D. S., Wilbur H. Hardy, 776 Hale Street, Beverly Farms, Mass., 1BH.

City Manager, Lester Pulley, 33 Porter Street, Melrose, Mass., 1DR.

This section, known as the Eastern section, has the greatest density of amateurs in the district. Includes lower N. H., Eastern Mass. and Rhode Island.

Assistant Division Manager, Donald Mix, 40 Stearns Street, Bristol, Conn., 1TS.

D. S., Harold C. Bowen, 168 Belmont Street, Fall River, Mass., 1AK.

D. S., Homer E. Nichols, 513 Pequonnock Street, Bridgeport, Conn., 1BM.

This section includes Western Mass., Conn., and lower Vermont. Connections to the second district trunk line will be arranged through this section, which will be known as the Western section.

Prospective relay men will pick out their nearest District Superintendent and inform him of their intentions if they wish assignments as official relay stations.

There will be many gatherings of amateur wireless men this coming season. To the chairman of the committees on arranging speakers for these meetings, the writer would like to suggest the following. Why not have these meetings on Saturday evening as far as possible. This will give speakers coming from out-of-town a chance to accommodate these clubs without interfering with their regular work which must still be done since greenbacks have long ago replaced clamshells for money. Relay officials are glad to come and contribute whatever little they may to the entertainment of the evening. It is much better to be able to lie in bed the morning after.

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Portland, Me., has started the ball rolling on conventions. On the 15th of September, Mr. H. W. Castner, A.D.M., arranged a very successful meeting at which the following prominent radio men were speakers: Radio Inspector, H. C. Gawler, K. B. Warner, Hiram Percy Maxim. 1UQ presided. In October, the date to be announced later, Mr. Bates of Worcester will entertain the relay men of New England at Worcester, Mass. Watch other columns of this issue for details. Let's all go and make it a success.

1TS, Mix, writes that radio matters are at their ebb in his section during August. Vacations, exceptionaally fierce QRN, and local thunderstorms are the reason. Springfield is again on the map in the person of 1JQ, Mr. McLean, who has QSO-ed 1AW. Providence also is coming strong with 1AAU, Mr. Learned, who is equipped with a modulated C-W set and works 1AW and 1QP, Reinartz of South Manchester, Conn. 1FQ expects his C-W set going soon, as does 1TS. District Superintendent Nichols has installed a counterpoise ground system and two stage amplifier. 1TS has a three step. 1BBL, Mr. David Moore of Farmington, Conn., has been appointed an official station.

Castner reports increased activity in his section. He anticipates even greater activity than last Winter. 1FV, Rahma W. Pratt, is holding down the key at present with great success. (We sincerely hope we understand this properly). 1FB, Cumming, is in on the DX. I have appointed A. Ralph Tabbot, 1OA, as D. S. for Bar Harbor District.

Robinson says he expects to be heard both on C-W and 500 cycle set by Sept. 1st. The DX stuff has been holding up remarkably well and some of the new C-W sets are coming in fine. 2FS comes in QSA. 1AR has a C-W. 1HA, Lloyd Greene, of Cambridge, is also heard occasionally on C-W. 1FR of New Bedford is heard up this way.

Our old friend 1HAA down the Cape is still at it. With unlimited power supply on the power end and a seasoned fist he manages to keep his message hook clear. If you can't clear it pass it to 1HAA. He is installing one of those new Grebe gaps, (must have got in early with Ponzi). His antenna is almost a duplicate of 1AW—a trifle higher and more wires. Got 2000 feet in antenna and 5000 feet in counterpoise ground. Expects to do some work this Fall. We'll say so. 1HAA has been heard in St. John's Harbor.

ROANOKE DIVISION
W. T. Gravely, Manager

In summing up the activities over the Division for the past month, there has been a decided curtailing in active operation, but I learn, from many sources, that great preparations are being made for the Fall and Winter months. New stations will be budding forth, and marked improvements will be noted in the old stations. Also, continuous wave sets are beginning to make themselves heard here and there, which shows that the fellows are busy, and are ever working for increased efficiency in their stations.

The QSS tests in this division were a complete failure, due, mainly, to the lack of recording stations. The transmitting stations were heard, and their sparks went out on normal radiation, but reports were so few that the data isn't worth reporting. Mr. Groves, Fading Analyist for the Division, will cover the ground in his report to QST, so I shall refrain from making further comments.

It is with a great deal of satisfaction that I am able to report the organization of North Carolina, which is under way. Mr. Bunker, District Superintendent, is working hard to open up routes, in short jumps, from Danville to Atlanta, in conjunction with the other District Superintendents. He is also working on the Eastern and Western Routes, and is meeting with a great deal of success.

We are now assured of a good station at New Bern, N. C., and another at Wilmington, so it seems that the coast line, from Norfolk on down, is an assured fact.

Unless it becomes necessary to change plans, the main Southern Route, starting at Washington, will be as follows; Washington, Fredericksburg, Richmond, Lynchburg, Danville, Greensboro, Charlotte, and thence to the South, with alternative, through Lynchburg (or Roanoke), Winston, Greensboro and Charlotte.

I have had letters from Mr. Rothlinger of Wilmington, and Mr. Parker of New Bern, and they both tell me that they will bend their efforts to assist us in the perfection of the organization. These two gentlemen may be relied upon, I am sure, to assist in every way possible, and to take part in the activities.

Mr. Herndon, Eastern Virginia District Superintendent, writes that activities in his section have been limited, due to the hot weather, and the almost daily thunder storms. He says that information has been received to the effect that the second hump from NAM on 200 meters is caused by re-radiation from the towers, and plans have been drawn up for a complete re-arrangement of the antenna system, and that when this has been done, it is hoped that the interference from this course will come to an end—it has long been a serious handicap to relay operations in his vicinity.

Report has come from Mr. A. G. Heck,

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Mannington, W. Va., District Superintendent, to the effect that radio operations have been at a stand-still in his District during the past two months, but that he expects at least three new first class stations in his vicinity for the fall and winter operations. He also states that 8ZW has been taking a course in VT operation, and expected to have a CW set, and phone, by Sept. 1st. (Go to it 8ZW—I hope the Aerial Ammeter will flutter for you). Will the serious amateurs all over West Virginia get in touch with the manager, so as to enable him to work out definite lines.

When this is published radio weather will be wonderfully improved, so let's all pull together, and round out a wonderful winter season.

3BZ will ring in a CW set, too, if he doesn't burn up all the tubes and meters to be found before he secures one millionth of an ampere radiation. The little bottles have a great deal in them, so friend Stanley says, but—it is as hard to get the juice out of them, as it is to get spirits out of an empty corn whisky bottle.

DAKOTA DIVISION
R. H. Pray, Manager

Because of the fact that there was practically no radio work being done in this Division last month there were no reports from the Districts and consequently none was sent in from this Division. But amateur radio is beginning to take a new lease of life and there will, no doubt, be a full report next month.

The Fading tests in this Division were almost a complete failure, due, I think, to the fact that there was not enough interest. Although the transmitting stations were on nearly as scheduled, there were no recording stations and no reports. Of course there were some of the tests during which the static was too bad for recording of any kind but there were also some that were very good for radio work considering the time of year. But as amateur radio. as practiced by most, is merely a form of recreation we can understand how when a certain WW called for a canoe ride by moon light radio absolutely has no attraction at all. However, I hope that in any future tests this division may at least do as well as our neighboring Divisions.

There have been several new appointments in this Division and to give every one a better idea of the men now in office we present the complete list.

Division Manager, R. H. Pray, 813 Fifth Avenue, Valley City, No. Dakota, Radio 9ZX.

District of Northern Minnesota, J. A. Gjelhaug, Baudette, Minn., Supt., Radio 9ZC.

City Manager of Duluth, Wm. D. Wagner, 123 W. 4th Street, Duluth, Minn., Radio 9EA.

District of Southern Minnesota, Boyd Phelps, Care Minnesota Wireless Assn., Room 416 Courthouse, Minneapolis, Supt., Radio 9ZT.

District of North Dakota, E. S. Leavenworth, Ellendale, No. Dakota, Supt., Radio 9WU.

City Manager of Fargo, Bert Wick, 207 Broadway, Fargo, No. Dakota, Radio 9AEJ.

District of South Dakota, Harold Larson, Viborg, South Dakota, Supt., Radio 9KG.

Mr. Boyd Phelps is also acting as Assistant Division Manager until October 15.

There is a determined effort being made to get Trunk Line A in shape to handle traffic regularly. There seems to be an outline for the route in working order at present, which is at least enough to start with and can be filled in as stations appear. The station of Mr. Bridges in Superior being the connection with the Central Division, it would run to 9ZC, 9ZX, and connect with the Northwestern Division through 7IM, the station of Mr. R. J. Simms at Billings, Montana. The relays as stated are rather long, being 225 miles from 9ZC to 9ZX, and approximately 600 miles to 7IM, but all of the stations in the order named have been working together through very bad strays during the month of August so that they should be able to handle traffic without difficulty with the coming of cooler weather. If 7IM gets out to the west as well as he does to the east trunk Line A seems sure of success. Work on trunk line G. from North Dakota to Houston, Texas, will begin as soon as there are enough stations to make it seem feasible. It is hoped that this route can be extended to Winnipeg at an early date.

Mr. J. A. Gjelhaug, 9ZC, Superintendent of the Northern Minnesota District reports increased activity in his territory and prospects of stations to fill in the trunk line early in the fall. There is another Winnipeg station being constructed, call 4AJ, which promises to be able to handle the relaying in that territory.

Mr. Larson, 9KG, Superintendent of South Dakota reports very little doing except in Sioux Falls.

Mr. Boyd Phelps, Supervisor of Summer Relay, and Superintendent of the Southern Minnesota District, has been working very hard at routes from the Twin Cities but owing to the fact that the amateurs in the Division have not had any interest in the summer work he has been unable to form any permanent routes so far. Now that the radio conditions are improving it may be possible to get more results, so will all the members of the A.R.R.L. and any amateurs who are interested please write Mr. Phelps, in care of the Minnesota Wireless Assn., 416 Courthouse, Minneapolis.

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A system for monthly reports has been worked out for the division which includes all members and if carried out will prove a means by which the relaying and other amateur work can be put way above standard. The success of this plan depends entirely upon the individual as unless everyone sends in a report each month the data gathered will not be sufficient to obtain the full benefit. Each member should send in a report of the officer of his territory, either City Manager, Assistant District Superintendent or District Superintendent on or before the 12th of the month. This should include all activities and observations in amateur radio during the past month and a list of stations REGULARLY heard and worked. The reason for this is that by giving a list of stations worked regularly it will be possible to make use of it for forming and completing routes. The list of stations heard regularly is asked for so that if any two stations are hearing each other regularly but never communicating it would be possible to arrange a schedule for these stations and thus help on the routes. PLEASE, EVERY ONE NOTICE and send in your report not later than the TWELFTH OF EACH MONTH.

Now that school has started and the many vacation activities outside of radio have ended it is hoped that all station owners will write their District Superintendents about their station and what they will or hope to do in relaying. Do not think that your station is not big enough to be considered on routes as the Manager has worked stations over 100 miles distant which were using Ford spark coil units and six volt storage batteries for transmitters, and this was and is still being done regularly. SO please write your District Superintendent at once. If you are in doubt as to which district you are in write to the Division Manager.

NORTHWESTERN DIVISION
Royal Mumford, Acting Manager

Either the winter relay season begins in August or there is no such a thing as season in amateur activities on the Pacific Coast. This is the unanimous verdict of all who have listened in consistently for the last month.

In the Northwestern Division we notice a marked diminution of static; but the number of relay stations is far below the normal. A couple of hours of solid grinding static and a few unsuccessful attempts at long distance work seem to dishearten many an amateur to such an extent that he leaves his aerial grounded for days at a time. But all this noise and bluff of old man QRN are only occasional outbursts, as of uncontrollable fits of anger which wear themselves out in due course of time. All through the summer there have not been more than two days a week on an average when the static did not slack up a bit some time during the night. The only requirement, then, for summer long distance work is for two DX men to be on the job at that time.

During the month of August some of the hottest days of the year were followed by wonderful nights when signals pounded in with winter-like intensity and their reception was marred only by more or less intermittent static. In fact on the very hottest day of the year for Portland and vicinity the first relay traffic for months was handled with Los Angeles direct. From 7CU at Vancouver, Wash., communication has been maintained with Los Angeles direct two or three times a week during the entire month of August. A.R.R.L. traffic has been handled in both directions. Great credit is due the Los Angeles stations for they are bothered a great deal more with static than we who are farther north.

Not only Los Angeles but San Francisco, and Santa Ana and Long Beach, all farther south, have been worked from here; and in connecting with San Diego the results were surprisingly successful for the time of the year.

In Portland, Ore., preparations are well under way for any amount of A.R.R.L. work this winter. New stations are appearing and most of the old gang of last winter are on the job regularly. We are glad to hear the spark of 7BR again. He is sure to do his share of long distance work. 7ZI of ex-7DK fame has his new set ready for business and is making himself heard in all directions. He has recently connected with California stations 500 miles away and soon expects to break his records of last season. Most of the traffic is at present handled by 7DS, 7DP, and 7BP, all of whom work north to Seattle and both 7DP and 7BP work Ukiah, Calif., successfully. 7CR has recently made some satisfactory tests with the forestry service stations on Mount Hood.

In Seattle the relayers are all looking forward to the QRN-less season this winter and are planning on more extensive participation in A.R.R.L. work. The same is true of Tacoma and Lacey, Wash. In this locality we have four stations which are to be especially commended on their consistent performance this summer, 7AD, 7BK, 7CE, and 7YS. And lest we forget their good work in the coming of the winter season and the multiplicity of relay stations, let me say that but for the work of these faithful few relay work in their locality would have been practically dead. We are highly pleased with our first attempt to stick to the job all summer.

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Amateurs in this division were startled to hear the spark of 5BR of Vancouver, B. C., which is the first Canadian station, so far as we know, that has connected with any of our "sevens". Mr. Wood is back at 6KL Oakland, California now. While at 5BR he worked stations in Seattle, Portland, and Vancouver, Wash. He reports increasing activity among the Canadian amateurs.

Olfan De Guire, 7CW, District Superintendent, Silverton, Oregon, has been doing excellent work this summer. He handles any number of messages from Seattle south and keeps the business moving with but little delay.

In Everett, Washington, we have a new spark 7FV which is QSA here. We are sure he will make a good relay station as soon as he is on the job regularly.

Our Division Manager, Mr. Hertz, better known as 7ZB to all who have heard his spark, has been away in Alaska with plenty of time to make plans for the coming season. He is back in our midst again now, and we will be glad to see him on active duty for the A.R.R.L.

In the Eastern section of this Division R. Earl Dawes, Box 663, Bozeman, Montana, has taken right hold of the work. With his assistants he is planning to put Montana on the map this winter and will start in as soon as the QRN subsides. The outlook for fall and winter is very good. The following have been appointed District Superintendents: Mr. L. L. Stanley, 7DJ, 320 State Street, Helena, Mont.; Mr. Grey, 7FL, care Grey Machine Shops, Butte, Mont.; Mr. Winfred Slausen, 7ZG, Bearcreek, Mont.; and Mr. Everett Cutting, at Bozeman, Mont., will assist Mr. Dawes in his work.

Currie N. Teed, District Superintendent, Kuna, Idaho, reports that little activity has been shown by local amateurs during the past month. Dry hot weather and unusually frequent electrical storms have caused a great deal of trouble, static often for days at a time being audible anywhere in the room. Considering the conditions in his locality one must admit that he is doing mighty good summer work and his efforts are appreciated.

PACIFIC DIVISION
A. E. Bessey, Manager

The radio situation on the Coast is very favorable for the summer time. Traffic has been going through in great shape. Never in the history of radio has traffic been handled in the summer time as this year. All the stations have been putting in high grade apparatus and amplifiers and getting their sets tuned so that they are getting through on LD work in fine shape.

In my report for the Bay District, will say that we have many good long distance amateurs who are reaching out in handling traffic. At the present time, 6BN seems to be doing the best work both North and South. He is handling messages direct with San Diego 6JI. His best station to work with in Los Angeles seems to be 6KP, 6EX, and 6EP. Many others are doing good long distance work.

It has been impossible for us to get through to the East during the summer owing to the fact that 6ZA is on a boat and his station is closed for the summer. The only routing there through the South, which is rather unsatisfactory, is through Arizona, but there are many new stations opening up in Arizona and one new special station at Yuma, so that we feel sure that this winter we will be able to work through the East without any trouble.

We have the promise of a good station to be set up in El Centro, California, within a short time which will help in bridging the gap to Arizona. It is to be hoped the San Diego district will be of valuable assistance in handling traffic to the East. At present, San Diego is being fitted to handle relay traffic at 6EN, 61Y, 61Z and 6JI. Mr. Milton Jackson has been appointed District Superintendent for San Diego.

Fresno is showing great interest in radio at the present time and although their conditions seem to be rather peculiar as they seem to be in a pocket and it was rather hard for them to get out, I think they can work up the valley to Sacramento; also to Los Angeles and San Diego. Their sets are getting more efficient all the time and feel sure by winter they will be doing good work.

Routing to Los Angeles from the bay district or North, can go through either 6BN, 6EP, 6EX, 6FS or 6UM. All can go through to the South. 6BR at the present time is out of commission on account of installing a new transmitter set and will be working soon under a special license, calling wave 200, working wave 375 meters, 150 meters for local work.

Would appreciate very much if all stations that feel they can do LD work would drop a card to 6BR as we wish to get our traffic stations lined up for this winter.

WEST GULF DIVISION
Frank M. Corlett, Manager

Reports from the various Superintendents throughhout the Division show that interest and activities that have been lacking to some extent are again making their appearance. This is indeed encouraging.

District Superintendent W. H. Tilley, 5ZU, Austin, Texas, makes the most interesting report for this month that has been made since he assumed control of that District. Austin will be well represented

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by 5ZU, 5BO, 5EJ and two or three more now in course of construction. 5ZU is now maintaining a daylight schedule every hour on the hour.

5ZN, Mr. Ed. Nettleton, of Eagle Pass, Texas, is making some extensive repairs on his station and will be with us with a dependable station which will open up things to the border. He is an old timer in the radio game, having been at it for years. He states that he will be ready for daylight tests immediately providing he does not QRM the Army station at Del Rio too much. If more of our members were more considerate of the Government stations we would be better off.

Mr. E. A. Sahm of New Braunfels is now in the air and says he will be glad to help us open up the way to San Antonio and judging from the strength of his signals now we ought to be assured of a real relay station in that town. San Antonio will be with us soon as we are promised a dependable station there about the middle of September through the effort of one of the old timers back from the war.

Mr. A. P. Daniels, 5AO, Houston, Texas, has been appointed Assistant District Superintendent and assigned the HOUSTON, TEXAS, TERRITORY. His report is interesting. Through the splendid co-operation of the Houston Chronicle and the Houston Radio Club fine results are being obtained in his territory. The paper is liberal with space and has a regular Radio Column every Sunday devoted to the Houston Club. Communications from out-of-town amateurs are invited. So far many smaller towns have been heard from and the station owners helped through the co-operation of the Houston Club members. Mr. H. E. Worthington is City Manager of Houston, his call being 5ZV. The Houston Club has a membership of 60.

5EO, Mr. John Whitworth, of Freeport, Texas, is making great improvements in his station and will have a reliable station there that will stand most any kind of a Texas storm.

Efforts are being made to get someone interested enough in Beaumont to enter the game but so far no results.

In Houston the following stations are equipped for relay work: 5AO, 5ZV, 5ZT, 5FL, 5ET, 5DX, 5HE, 5ZW. 5ZW and 5AO have maintained a daylight schedule twice daily all Summer for which they deserve great credit. The Radio Inspector is due in Houston soon and many are gettting ready to take the examinations.

5YA, College Station, Texas, is erecting steel towers and the A.R.R.L. is assured of a good station there soon. From the ground they covered with 30 foot antennae last winter there is no telling what they will do this winter.

Mr. Raymond L. White, 5AP, District Superintendent of the Northern Texas District, has returned from his vacation and in less than an hour or so was heard in the air again. Due to the intensity of atmospheric disturbances very little relay work is being done at night but at intervals we hear some good fellow-member tussling with old man static trying to hand a few messages over in short jumps and numerous "QTA's" are heard. The Assistant District Superintendents are taking advantage of the occasion and are putting over some commendable organization work. Among those deserving mention are Henry M. Harris of the Waco, Texas, Territory, and Martin, 5IF, of the Amarillo, Texas, Territory. No doubt 5IF will relieve the now congested condition westward and will grow into prominence as 5ZA has on our way westward; it will also reduce the long jump somewhat. A City Manager is to be appointed for Amarillo proper, which looks good toward minimizing interference. Keep the good work up, Martin, we are with you.

Harris at Waco has been assigned the call 5GJ. He has assisted in getting a station underway at Stamford, Texas, which will be right in line west from Waco and should make a good relay point. If someone would just come forward with a relay station at Sweetwater or Lubbock, the route west to Roswell would be a certainty, static or no static. 9RY is heard at Amarillo quite frequently and 9BW and 9LR have been heard often in Dallas and vicinity lately.

The district of Oklahoma again begins to look promising. Mr. Lawin G. Dill, 234 South Broadway, Oklahoma City, was in Dallas recently and called on the Division Manager. Mr. Dill stated that he would have a 1KW in first class working order shortly. Mr. Walton of Oklahoma City will also have his station working regular, Mr. Dill stated. This will give the A.R.R.L. two stations in the central part of Oklahoma. With 5BT at Blackwell and 5DO of Perry, 5BM at Muskogee, and several other stations that we know of, Oklahoma should be with us in the relay game very shortly. The Division Manager is working under a handicap regarding Oklahoma. The Oklahoma stations have never been received at headquarters with any great signal strength and for this reason the District Manager has not been able to determine which station owner would make the best District Superintendent for Oklahoma. I am going to put it up to the Oklahoma station owners to suggest which man they think would make the ideal District Superintendent for Oklahoma. In making your suggestions remember it is the policy of the League to select only those which are best fitted for relay work from the point of view of radio equipment, reliability of operation,

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and the time he is willing to devote to relay work. Oklahoma should by all means have a District Superintendent to take charge of the relay activities and assist in getting Trunk Line "F" working from Dallas to the Northern boundary of this Division. Let every amateur in Oklahoma offer a suggestion.

ONTARIO DIVISION
A. H. K. Russell, Manager

August has been marked by a profound deadness in amateur wireless, due to the holidays and to the fact that a great number of amateurs are on commercial work on the Lakes. However, with the coming of the fall wireless should again come into its own, and be bigger and better than ever.

The report for August must be of necessity brief, for the District Superintendents have omitted to make reports for the month, probably due to lack of material. However, the Superintendent in Western Ontario, Mr. Carter, advises that prospects never looked better for a successful season in his district and the same information comes from the secretary of the Club operating in affiliation with the A.R.R.L. in Northern Ontario.

So far as Toronto district is concerned it is hoped that there will be at least one and probably two medium powered C.W. transmitters in operation, with which it is hoped to establish steady C.W. communication with "8" stations. In any case a reliable outlet for Ontario traffic for the winter should be available through Niagara Falls, N. Y.

ATLANTIC DIVISION
Chas. A. Service, Jr., Manager

The past month, being a vacation month, is probably the most inactive month of the year from a radio standpoint, in spite of the fact that the actual work done by those who have remained at home has been greater than ever before. Stations that in former years were only heard during the winter months have been heard frequently throughout the summer season, and with the advances that will no doubt be made during the coming winter season it is believed that more actual relay work will be accomplished than ever before.

The report of the Traffic Assistant for the Central Pennsylvania District, Mr. Herbert M. Walleze, who is acting as District Superintendent during the continued absence from home of Mr. Cawley, shows that conditions in that section of the State are dull, but that there is considerable activity in remodelling and improving stations. Among others that are improving their stations is 3ABD at Danville, Pa., which is one of the stations that we are depending upon this coming winter to fill in on the gap between Reading and Milton on Trunk Line B.

Unfortunately the Eastern Pennsylvania District is without the assistance of a District Superintendent since the resignation of Mr. Ferris, but the question of filling this vacancy will receive early attention. We had hoped by this time to have received definite information from Mr. C. M. Jackson, of Pottsville, that his transmitting set was in operating condition, as a station at this point could be of considerable aid in bridging the gap between Reading and Danville or Milton. The last information received from Mr. Jackson in April last indicated that he was about to install his transmitter, but since nothing further has been heard from him by the former District Superintendent. Station 3HJ at Haverford, Penna., has been doing good relay work in this District, and can probably be counted upon in the future. Station 3ZS again is in operation, after some necessary repairs to the spark gap, but so far the set has not been properly adjusted to work on the lower wave length of 200 meters, but it is hoped that this difficulty will be overcome shortly.

Mr. C. S. Horn, Superintendent for Delaware, has returned from a commercial trip to Holland and Belgium. He states that he has not yet been able to get his station in operation at Rehoboth as he expected, and, as the summer is about over, it is not likely that he will accomplish much at this point this season. He states that he has information which leads him to believe that a new station will be set up somewhere half way between Wilmington and Baltimore, and that he will endeavor to give what assistance he can in making this proposed station an efficient one for relay work between Wilmington and Baltimore. Station 3OB at Wilmington, Del., has been doing some good work during the summer, and has extended his range to some distance, which is promising for the coming season.

Mr. Duvall, Superintendent, Eastern Maryland, reports that he has been in touch with Washington station owners, and that in conjunction with them every effort will be made to establish reliable communication between Baltimore and Washington in the near future. The vacancy in the office of District Superintendent for the District of Columbia will no doubt be filled within a short time, as this matter is now being given attention, and when this is accomplished better results can be looked for. Mr. Duvall gives in detail in his report data relative to Baltimore and Washington stations, and in addition to this survey Mr. Duvall is sending out a questionnaire to

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station owners in that vicinity with a view to obtaining all the data possible on the equipment of these stations. Taken as a whole Mr. Duvall's report indicates renewed interest on his part, and we have hopes that with hearty co-operation on the part of Wilmington, Baltimore and Washington stations the difficulty of communication in this section may be overcome in the near future. It will certainly be a satisfaction if this can be accomplished.

MIDWEST DIVISION

L. A. Benson, Manager

The Division Manager is glad to report that keen interest in both Relay and League work is now being shown by all District Superintendents and Assistants. Several District Superintendents have recently returned from their vacation and are at it hard getting things lined up. Distant stations are beginning to roll in like old times, the weather is getting colder, and everything points to the fact that a big season is before us.

J. A. Fritz (9KO), District Superintendent, Eastern Mo., has appointed Mr. J. Giesecke, 15 Fairmont Place, Jefferson City, Mo., (9AJN), as Assistant District Superintendent, Eastern Mo. This will prove a valuable station in handling traffic to Kansas City from St. Louis.

G. Turner (9DU), has just returned from the west coast where he had the pleasure of meeting Seefred Bros., 6EA. Mr. Turner is trying to locate a good reliable station in Denver where he states there are none at present. He says 9ZF has sold his station and decided to quit the game; this leaves practically no long distance station in Denver.

J. G. O'Rourke, District Superintendent, Eastern Nebraska, reports all his routes working perfectly and several new ones now under way. He has just returned from a tour through the state and reports interest lacking in the following towns: Norfolk, Freemont and York. Any stations in these towns kindly report to the District Superintendent.

P. A. Stover (9JA), District Superintendent, Iowa, has given up CW and is getting his spark set in trim. Mr. Stover wants all stations located in the extreme western portion of Iowa to kindly get in touch with him at once.

H. L. Owens (9EL), District Superintendent, Kansas, has recently returned from his vacation and is unable to give his report in time for this issue. However, he wishes all stations in his respective territory to communicate with him regarding appointments on several western routes through the state.

BULB OSCILLATORS FOR RADIO TRANSMISSION

(Continued from page 8)

curves. From these waves the losses and output of the oscillator may be determined

Thus by assuming various values for the potentials and plotting first the appropriate characteristic curves and then the waves, the behavior of an oscillator under all possible adjustments and loads may be examined. Usually such a process is far too laborious for a general numerical investigation, but is useful for a qualitative study.

As a matter of fact, the curves of Fig. 6, 7 and 8 have been so chosen as to represent underload, normal load and overload, respectively, of a bulb oscillator with fixed supply voltage E_b, fixed grid bias resistance R_c, and fixed ratio n of alternating plate voltage to alternating grid voltage. With the light-load conditions of Fig. 6 (corresponding to a low antenna resistance in Fig. 9 and 10), the alternating and direct components of plate current are relatively small, while the alternating components of the potentials are high. The minimum of plate potential is then slightly negative, causing all of the space current to flow to the grid for an interval and giving a sharp dip to zero in the plate current curve. This does not harm the bulb, but the output is much below that attainable from the bulb. With the normal-load conditions of Fig. 7, the potentials vary over narrower ranges and never permit an excessive grid current; so the plate current has little or no dip and is higher than before. With the heavy-load conditions of Fig. 8 (corresponding to a high antenna resistance in Fig. 9 and 10), the potentials vary over still narrower ranges and the minimum plate potential is much higher. This greatly increases the loss at the plate and will overheat the bulb, though the power output is not greatly different from that in Fig. 7.

The direct voltage (bias) and the alternating voltage (excitation) of the grid circuit are chosen with a view to giving high output and high efficiency, but are not highly critical in adjustment. The best ratio (n) of alternating plate voltage to alternating grid voltage has sometimes been considered to be equal to half the amplification constant of the bulb, this corsponding to an external (load) resistance in the plate circuit equal to the internal resistance*. But considerably higher grid voltages may be desirable.

On the whole, the proper load, bias voltage, and excitation voltage of a bulb oscillator, as well as the heating current and the plate generator vlotage, are best determined by direct test. These quantities are all constants of the bulb and do

(Continued on page 37)

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WITH THE AFFILIATED CLUBS



WE take pleasure in announcing the affiliation of the following societies, which was completed at the last meeting of our Board of Direction:

Plattsburgh Wireless Club, Plattsburgh, N. Y.
Radio Club of Paterson High School, Paterson, N. J.
St. Louis Radio Assn., St. Louis, Mo.
Connecticut Valley Radio Club, Springfield, Mass.
Yates Radio Club, Penn Yan, N. Y.
The Summit Radio Club, Erie, Pa.
Troy YMCA Radio Club, Troy, N. Y.
Rochester Radio Club, Rochester, N. Y.
Central Maine Radio Club, Waterville, Me.
Pomona Radio Assn., Pomona, Calif.
Radio Club of Syracuse, Syracuse, N. Y.
Crescent Radio Club, Clearfield, Pa.
Bethlehem Radio Assn., Bethlehem, Pa.
Marietta Radio League, Marietta, Ohio.
Miami Radio Club, Miami, Fla.
Radio Club of Tacoma, Tacoma, Wash.
Columbus Radio Club, Columbus, Ohio.
Baltimore Radio Assn., Baltimore, Md.
Ann Arbor Radio Assn., Ann Arbor, Mich.
Radio Club of Burlington, Burlington, Iowa.
Galesburg Radio Assn., Galesburg, Ill.
Radio Club of Washington, Washington, D. C.
Radio Research Club of New York City, New York, N. Y.
Wireless Assn. of Atlantic City, Atlantic City, N. J.
Southern California Radio Assn, Los Angeles, Calif.
Radio Club of Glen Ridge, Glen Ridge, N. J.
Essex County Radio Assn, Salem, Mass.
Cass Radio Club, Detroit, Mich.
Framingham Radio Club, Framingham, Mass.
Oshkosh Radio Club, Oshkosh, Wis.
Utah Radio Assn., Salt Lake City, Utah.
Radio Engineering Society, Pittsburgh, Pa.
Eastern Ohio & Western Penna. Radio Amateurs Assn, Newcastle, Pa.
Sunset Radio Club, San Diego, Calif.
Springfield Radio Assn., Springfield, Mass.
Central Michigan Wireless Assn., Lansing, Mich.

The number of organizations now affiliated with the A.R.R.L. totals 85—all of them live wires. This number includes most of the radio associations of prominence, and marks our progress toward the formation of a network of local organizations which will bind us all close together in matters which concern Amateur Radio.

The A.R.R.L. Secretary will be glad to hear from clubs who think as the A.R R.L. does on amateur affairs.

THE CHICAGO CONVENTION

The greatest meeting of amateurs ever held occurred in the convention of the A.R.R.L. Central Division at Chicago, Sept. 2d, 3d, and 4th. It was great in many ways. It was marked by enthusiasm of the highest pitch; the interest and value of the sessions were the best ever; and it was the first time in our history that amateurs from many miles have gathered for a three-day discussion of their affairs.

As most of us know, there is in existence in Chicago an organization known as the Chicago Executive Council, comprised of



Edgewater Beach Hotel, Scene of the Convention.

the officers of the three prominent clubs there— the Ravenswood, the South Side, and the Progressive, all affiliated with the A.R.R.L.—with the Chicago City Manager, Mr. F. H. Schnell, as Chairman. This board meets whenever desirable, and administers all amateur affairs in the city. The co-operation is wonderful, and they are doing great things in the reduction of QRM, etc. It was this organization which, at the instigation of Mr. Mathews, the Division Manager, arranged and engineered the convention. They did a most splendid

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job of it, and we cannot better describe it than by saying that it was done in typical Central Division style—than which there is none more thanwhicher.

The beautiful Edgewater Beach Hotel, on Sheridan Road, was the scene of the activities. 9ZN is located on the northern end of the hotel grounds, and of course was the center of interest. The weather thruout was ideal, and contributed to the pep of the meeting. On the first day the visitors were registered at 9ZN, and thruout the day, and the next as well, many of us met for the first time men whose sparks we have known for long. It was a continuous session of greetings and the formation of new friendships—absolutely F.B. for all of us.



THE CHICAGO EXECUTIVE COUNCIL

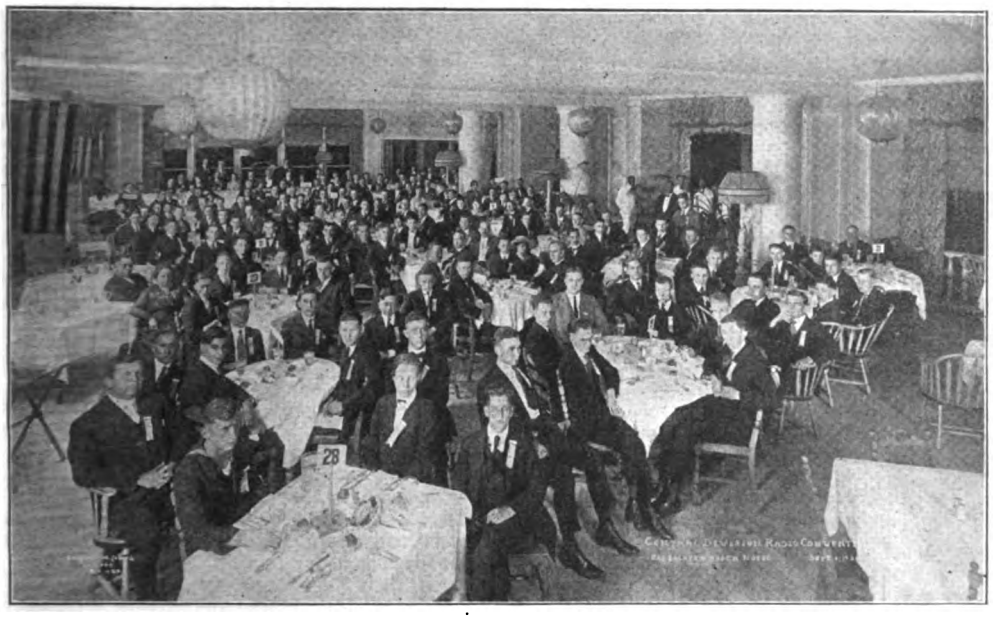
to whom credit for the success of the Convention is due.

First row, left to right: F. H. Schnell, Chicago City Manager; C. C. Kolster, Radio Inspector 9th District Department of Commerce; R. H. G. Mathews, Central Division Manager. Second row, left to right: G. A. FitzSimons, Traffic Assistant to the Division Manager; S. Wnorski, Ravenswood Radio Association; W. Holst, President Ravenswood Radio Association; M. Romberg, President South Side Radio Association; J. Novak, South Side Radio Association; B. Stolte, South Side Radio Association; J. Sholtes, Ravenswood Radio Association; N. Wunderlich, Ravenswood Radio Association.

In the evening the first meeting was held, in the Black Cat room of the hotel. This was a general business meeting of the Central Division, presided over by the able Mr. Mathews, and "Co-operation" was the keynote. It is probable that never before was this subject so thoroly discussed in all its aspects—and very good it was, too, for our very existence as amateurs depends on this. Mr. Maxim, our President, was the first speaker, and discussed our affairs from the national standpoint, urging co-operation in all our activities. Mr. M. B. West (old 8AEZ) was next, and discussed the probable trend of legislation and the desirability of co-operating with the government branches. Mr. F. F. Hamilton, 9ZJ, also spoke briefly on the same subject. Mr. K. B. Warner, A.R.R.L. Secretary, spoke on a few phases of co-operation, particularly with our QST and in the improvement of operating efficiency. Mr. Schnell, City Manager, outlined the "Chicago Plan" and its method of functioning, and was followed by Radio Inspector C. C. Kolster, incidentally Chairman of the Trial Board of the Executive Council, who discussed the relations of his office to the amateurs and complimented the local men on their methods. Mr. W. L. Holst, President of the Ravenswood Radio Assn, described the formation and growth of that club, and the results that are now being secured by all the local clubs thru co-operation.

The forenoon of the second day most of the visitors journeyed by auto to NAJ, Great Lakes, where they inspected the radio training school, ate navy chow for lunch, and otherwise enjoyed themselves, thru the courtesy of Mr. West, Lt. Comdr. McCauley, and Lt. Arney. An impromptu indoor baseball game was played on the grounds adjoining 9ZN, in the afternoon, and in the evening a technical meeting was held at the hotel. This was a REGULAR hamfest, and like all the other meetings, was 1:30 a.m. breaking up, only this one was more so. Mr. Maxim gave an extremely interesting talk on the sound values of various "noises"—pointing out the requirements in radio development to produce the most sound from a given amount of energy. Mr. H. E. Rawson had on exhibit a variety of British apparatus, including a 6-stage radio frequency amplifier and some power bulbs, and described them and his recent trip to England in most entertaining fashion. Ye Ed urged the adoption of radio-frequency amplification, better quenching in our rotary gaps, and unburdened himself on the subject of C.W. Mr. Montraville Wood, of Berwyn, Ill., inventor of the "submarine ear", a device for the auto-steering of torpedoes by sound waves emanating from the enemy ship, made an interesting demonstration of his device. A lamp was caused to light when

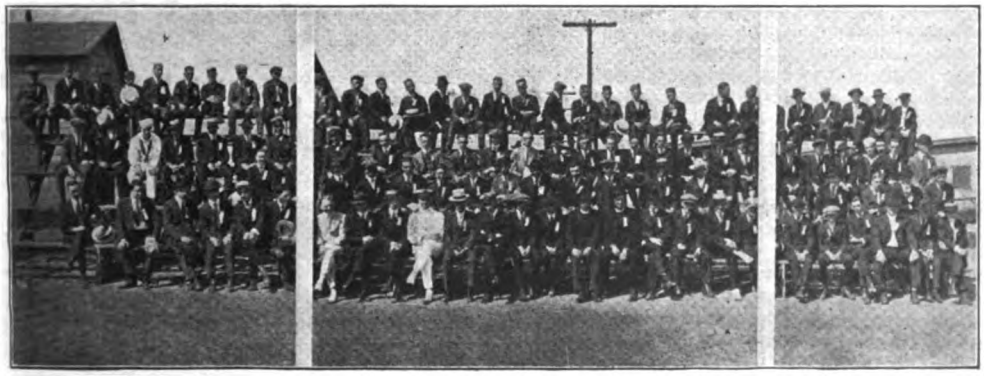
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The Banquet, on the night of Sept. 4.

certain words were spoken near the sensitive diaphragm, yet it was insensible to other words. It was also caused to operate by a part of the audience clapping hands in unison, and a startling conclusion was reached when Mr. Wood switched in a small "cannon" which exploded with a deafening roar the next time the hand-clapping occurred. After a ten minute intermission, Mr. L. C. Young spoke on the work at NSF, using a C.W. transmitter and a multiple-tuned antenna; Mr. J. H. Miller delivered a paper on radio measuring instruments and their uses, particularly pointing out the superiority of the thermo-couple type of meter; Mr. T. B. Lambert, of Lambert & Associates, described an early invention for obtaining secrecy in transmission by rapidly changing wave length, with a synchronized receiver; Mr. F. S. McCullough, of the Glenn L. Martin Company, displayed his new 75-watt tube and described some of the work in tube transmission done at GMA, now 8ZC; and Mr. M. B. West, pioneer in amateur spark work, gave a valuable talk on the design of amateur transmitters, particularly the steps necessary to obtain a lower decrement in spark sets to comply with the probable requirements of new legislation.

Those who were sufficiently active to get up on time the next morning, made an auto trip over the boulevard system of Chicago, stopping to inspect a few amateur stations, and in the afternoon the radio field events were staged in the grounds surrounding 9ZN. There were



The Gang, photographed while visiting Great Lakes.

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hookups to trace out and correct, and jamming contests in which the contestants copied signals on a small hand loop fitted with a crystal detector and phones Several hundred dollars worth of apparatus was awarded as prizes to the winners.

On the night of the last day occurred the best time of all, the banquet, where good fellowship reigned supreme. It was held in the beautiful Colonial Room of the Edgewater Beach. Most of the local men had their O.W.'s with them, and "bright the lamps shone o'er fair women and brave men". It was a brilliant assembly of the best radio men in the central states, and was heartily enjoyed by everyone. Music every seven minutes provided the necessary urge for dancing, and made anything like a "speech" impossible. Brief remarks were made by Messrs. Maxim, Holst, and Warner, the latter presenting for its first public inspection the Sacred and Venerable Wouff Hong. It was peculiarly appropriate that this should first occur in the home Division of The Old Man. Suggestions as to the method of employing the Wouff Hong were called for, but the best that could be obtained was to "hook 'er to yer bulb". (Yep, the whole Tresco outfit was there) So many interesting things occurred during the banquet that we must make the description short or there will not be anything else in this QST. D. F. Tainsh, Ravenswood jazz hound, gave a demonstration of his art by accompanying the orchestra on an impromptu xylophone constructed of tumblers with various levels of water therein, plus an empty cigar box and a serving tray. Prominent amateurs stood up and were identified by call letters. A letter from the Old Man was received by special messenger, commenting on the meeting as only the Old Man could, and expressing regret that he could not be present. A questionnaire, the craziest thing that could be imagined, and reproduced below, the product of the disordered brain of Joe J. Novak, was filled out by the guests, prizes to be awarded the best answers. A very cursory inspection of the results showed that one of these was so much superior to the others as to merit some extra Grand Prize, and Mr. H. H. Peterson was formally presented with one brand-new E. I. Co. Tesla Coil in recognition of his achievement. The committee had scoured all the antique shops for a Roller Shade Condenser, but none were to be had. QRM contests, the guests copying signals picked up on a small aerial and put out thru a loud-speaker, were held, and prizes are being distributed to the winners.

The Executive Council has commenced the publication of a monthly sheet entitled the "Grid Leak", and the first issue was out as a Convention Bulletin and contained all the news. It is a live, peppy sheet, and will do much good.

It was a wonderful meeting—one which did much for the cause of Amateur Radio. It stands as the high water mark of amateur achievement to date, and the next crowd to improve upon it will have SOME job on their hands. We make our best bow to the Chicago Executive Council. Too much credit cannot be given the Central Division Manager, the indefatigable Mr. Mathews. He was everywhere at once, seeing that everyone was happy, and at the meetings he proved a most capable Chairman and Toastmaster.

SIDELIGHTS ON THE CONVENTION

The oldest amateur present was Mr. F. M. Bookwalter, of Springfield, Ohio, 84 years young; his enthusiasm was the peer of anyone's. The youngest member attending was Mr. J. R Miller, 9CP of Hammond, Ind., aged 14. 9CP has a first-class station, has passed his 20-word test, and is prominent in relaying in the Chicago district.

It passed the comprehension of one amateur present at the technical session that a priest could be a radio bug. Approaching Rev. A. J. Manning, he inquired: "Mister, are you interested in wireless?" We'll say 8DA is—rather!

W. H. Kirwan and the Iowa delegation were present with bells. On the rear of their car was a large sign with the Davenport slogan: "Hook 'er to yer bulb!"

Did you see Matty's bulletin board at 9ZN—a sheet of bakelite only worth about $25. If any of you fellows get a Paragon with some chalked announcement on the inside of the panel about "Grand Banquet to-night", you'll know how it happened.

Did you meet the representative of the Wooden Audiotron Co.?

St. Louis, altho not in the Central Division, was represented by a delegation of about ten men. Yes, Bill was there.

Now for Novak's questionaire. The questions were as follows:

If Marconi wasn't a Frenchman and yet the inventor or or wireless put yes here.....but if DeForest invented the Armstrong system draw the symbol of a variable condenser here.....
Do the electrons flow from the plate to the grid? If not how do they flow? From.....to.....
If the high voltage on your grid should be positive, put NO here..... and if it should be negative, answer in the negative here.....
If a non-synchronous spark transmitter produces undamped waves, put the symbol for a generator here.....and if you think that the polarity of your ground lead is positive, answer in the negative.....
Has an undamped set a decrement.....what is it.....

(Concluded on page 37)

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1HAA, MARION, MASS.

Ent: "Who is this guy 1HAA?"
Wistle: "I don't know, but the call sounds vermilya."

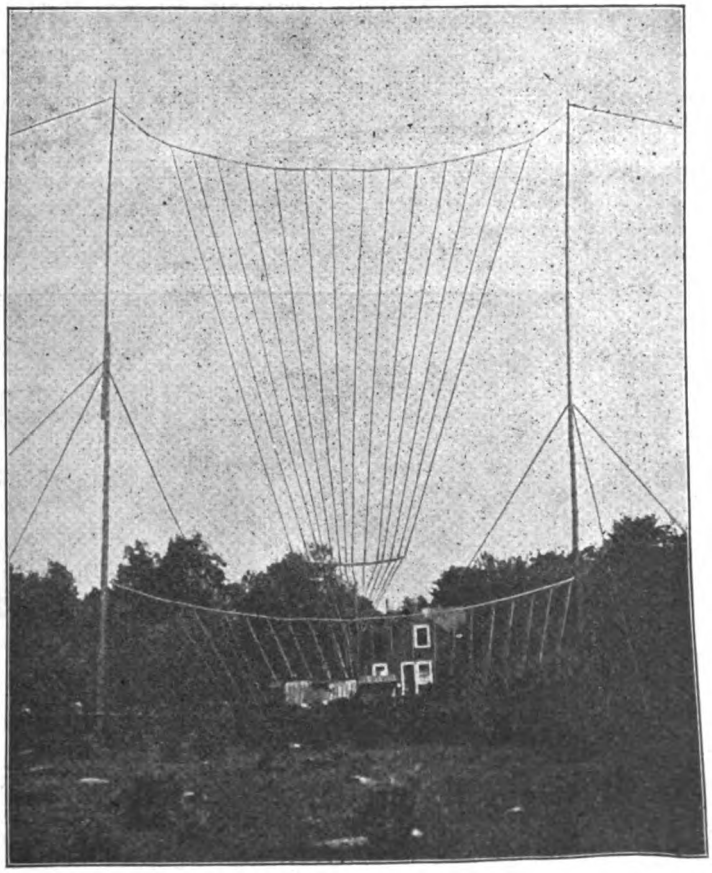
With which VN once again breaks into our pages. Yes, Irving Vermilya—who doesn't get enough radio working all day at the Marion transatlantic station and so has to pound brass on 200 at night.

1HAA has made a most enviable reputation and is counted one of our strongest eastern stations for the coming winter. We present here several views of his equipment.

The aerial is perhaps the most interesting. It is slanting flat-top, but like 1AW's it is nearer a fan than a flat-top. Two 100-foot poles, 54 ft. apart, support the upper ends of 20 No. 14 bare copper wires, which are spaced 2½ feet apart across a cable which in turn is carefully insulated at both ends. These 20 wires are 97 ft. long and terminate on a wooden spreader supported by a low pole set 62 feet back of a line connecting the two main poles. The spacing at the bottom spreader is 1 ft., and from there a 19-foot lead-in runs to the set.

1HAA uses a counterpoise, consisting of 50 wires covering an aera of 50 ft. wide and 100 ft. long, supported 4 ft. above the ground by 20-inch insulators on each of the four corners, and carefully insulated from all grass or ground. This seems to us a most excellent arrangement.

The transmitter comprises a 30,000 volt United Wireless "coffin", a Grebe synchronous rotary (altho this photo shows an old Marconi ship rotary), a "doctored" Clapp-Eastham O.T., and a condenser consisting of 36 Marconi jars of .001 mfd. each, in series multiple, giving a capacity of .01 mfd.



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The receiving set consists of a Grebe CR-1, using a Marconi hard tube as a detector (Hey!), and a 2-step amplifier made by Hammond, using the same kind of tubes.

This station's operator is addicted to the use of the bug. When you hear a bunch of hash and all you can make out is the "1", log it as 1HAA—a good call for a Funny-Man.

5ZP
NEW ORLEANS

(Photo on next page)

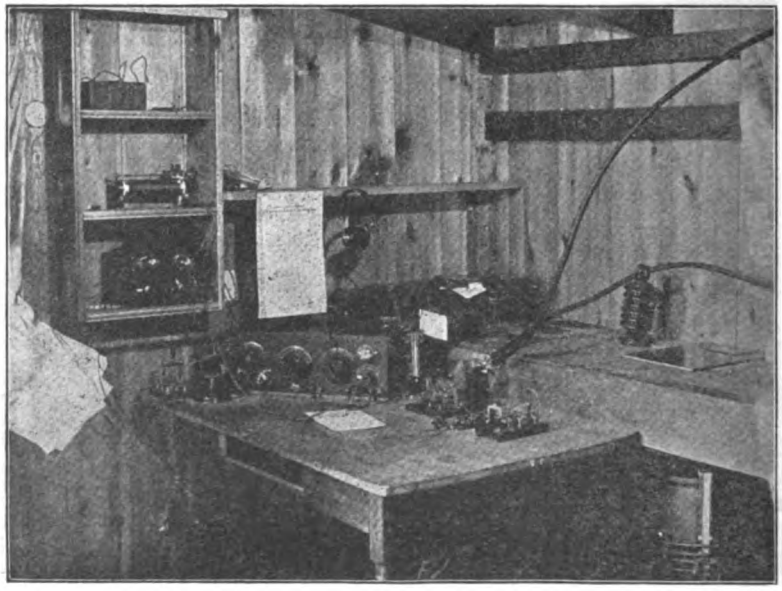
This station is owned and operated by Hubert E. de Ben, and is located at 1044 City Park Avenue, New Orleans, Louisiana. The sigs of 5ZP have been heard in twenty states.

The aerial is an inverted "L" type, 40 feet high and 50 feet long of five number fourteen wires. With the present high grade apparatus used by the average amateur, excellent results can be obtained with a small aerial.

The ground consists of galvanized wire netting buried six inches in the ground directly beneath the aerial. Connections are also made to the water pipe and several small lengths of pipe driven in the ground.

Two regenerative sets are used for receiving. One is used for wave lengths from 170 to 450 and the other is employed for a detector.

The transmitter consists of a Winger ½ KW transformer (only four miles from NAT), Grebe rotary spark gap, Dubilier and Klitzen condensers, Thordarson oscil-

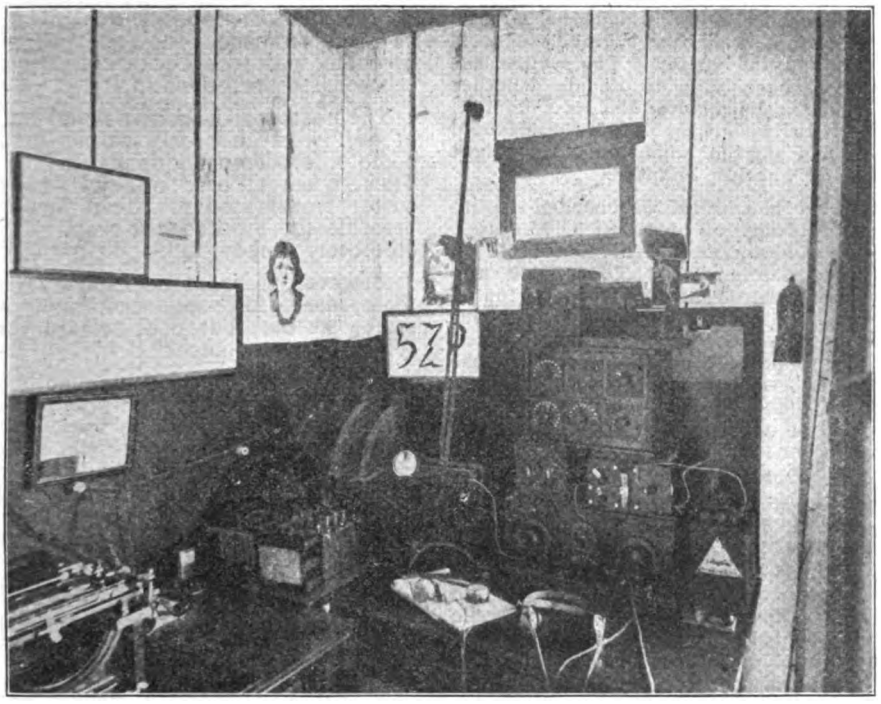


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lation transformer, Westinghouse ammeter, etc. The transformer, protective-device, fuseblocks, etc., are under the table. The radiation on 250 meters with a decrement of .10 is 5 amperes.

Actual work has been carried on with the following stations:

NSF, Anacostia, D.C.,	northeast,	1000 miles.
3EN, Norfolk, Va.,	northeast,	970 miles.
5ZA, Roswell, N. Mex.,	west,	950 miles.
9KM, Peoria, Ill.,	north,	800 miles.



THE CHICAGO CONVENTION

(Concluded from page 34)

If you think that you are correct this far answer NO.....and if you believe that you have missed some, put NO here.....

If you know that you are as foolish as the bird that wrote this, write NO.....and if not write NO anyway.

If QST is published in Hartford, Mass., don't answer the next question but tell us what the call of Arlington is here..... If you prefer to have Naval control of radio amateurs, write the word NO.....and if not, fill in the last question with your initials.

Now that you are near the end, go back and write YES in place of the first and third where you have written NO. If you don't know what we mean answer in the affirmative.....

How many licensed amateurs do you think are in Chicago?.....

If you are so good that you have gotten all the above answered correctly thereby winning the first second or third prise, do you agree to appropriate one dollar for this honor?..... Write YES.

Mr. C. W. Patch, of 5 Villa St., Dubuque, Iowa, has favored us with a set of eleven photographs which he took at the Convention. We regret that space does not permit us to publish all of them. Anyone desiring prints of these photographs, all of which are very good, can secure them from Mr. Patch at 12½c each, plus postage.

BULB OSCILLATORS

(Continued from page 30)

not depend on the wave-length or other characteristics of the load. When no data of the oscillating circuit is available, the r.m.s. value of the plate alternating voltage (E_p) may be assumed one half of the plate generator voltage (E_b) and the efficiency may be assumed 50%; the bias resistance (R_c) and grid alternating voltage (E_g) should be made adjustable, the probable values being assumed, using Table II as a guide.

*The relation between these resistances is determined wholly by the voltage ratio, (n); for any change in the external plate resistance would be followed by a corresponding change in the internal resistance, the latter not behaving as a constant in a self-excited oscillator under varying load.

(To be continued)

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Another C.W. Problem Solved

By J. O. Smith, 2ZL.

AN issue of QST not far removed from hence contained a story of the development of amateur C.W. transmission in which the author, Mr. H. L. Stanley, made several references to the writer. The writer has not as yet been able to decide whether these remarks were intended as a compliment or a brick, but, as long as our friend Stanley has started something, we might as well add another chapter.

After we had finally succeeded in injecting that ampere or so of C.W. juice, energy, or whatever the blamed stuff is, into an antenna, every Tom, Dick and Harry and a couple of hundred cousins of theirs, all of them, collectively and individually, took the greatest possible delight in very politely informing us, because they thought we would like to know, don't you know, that while the C.W. signals were fine, could be read through QRM, QRN and all the other Q's don't you know, they swung badly, **oh yes**, very, very much.

Bless all and sundry of their dear hearts, we knew they swung. We positively knew it. We knew it only too dingbusted well. Just imagine—here we were actually doing something that everybody doubted could be done because all the F. A.'s in the radio universe agreed C.W. transmission on short wave lengths was impossible, because it would swing so badly that no one at the receiving end would be able to follow it.

Well, anyway, friend Stanley, in his wise way, one day suggested that he had access to some radio experts and he would try and find out what caused our dinky signals to swing. "Try" was good, because nobody knew. So we started out ourselves to solve the universal problem of swinging C.W. signals on midget wave lengths.

For once in our lives, 2FS and the writer agreed. We agreed that the swing was due to a change in wave length or frequency or something, but we weren't quite sure what.

It was concluded, however, that in some way a change occurred somewhere in the antenna or ground system and we, accordingly, tried transmission under different conditions of weather, to see if we could blame it on the antenna. We decided that we could. We found that on calm nights the signals were much steadier than on windy nights when the antenna was shimmying. So, presto!, quick, like that, the great idea came to us, that if we could have a stationary antenna, we could avoid changes of capacity, etc., consequently changes of everything else touchin' on and appertainin' thereto. The signals would be readable without the receiving operator spraining both wrists in turning knobs, etc., in trying to keep them in.

The next day the writer bought a pound of bell wire and some carpet tacks and made a stationary antenna in the attic. Then, when all was set and ready, the writer transmitted to friend Stanley and breathlessly awaited the reply, "Signals absolutely steady, QSA, no swing".

However, the next time the transmission took place, 2FS reported "your signals swung at first but O.K. toward the last. What did you change?"

That was a hard one, as nothing had been changed. The same thing happened occasionally afterward on various periods of transmission and finally the writer got rather hot about it and opened the window of the operating room for air. As he did so, he heard a steam train of the Long Island Railroad disappearing in the distance. Evidently the train had in some way affected those C.W. signals although the railroad is four blocks away. When the next train came along the result was that no swing took place. We were stumped.

The the writer recalled a journey he once made in the southwest. The train had been bumping and joltmg along over the rails in terrible fashion for two or three hours. All at once it settled down and ran along so smoothly that the writer remarked to the conductor that they must have put in new rails on that particular streatch of track, or something. "Oh, no", said he "we ran off the rails back there a ways and we are now running on the ties."

Could it be possible that the same thing had happened to that second Long Island train?

But no, it finally developed that a heavy freight train would cause enough vibration to shake up the bell-wire antenna and a passenger train wouldn't. So the next day the indoor antenna was nailed fast for keeps and whether they now run on the rails or ties makes no difference, the signals do not swing any more.

And so it came to pass that another great engineering problem was solved and given to a breathless, waiting world—at a cost of sixty-five cents.

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The Editor would like to have the address of Mr. Gilbert E. Mears.

Bill Woods was telling us about an amateur in Wood River, Ill., who operates a 2-inch spark coil and two sections of Amrad quenched gap from the magneto current of his Ford. All he has to do is to crank up the Henry, and he has his own power plant, and can get any note he wants. This takes the platinum gridleak.

Have any of our experimenters who have worked with Oudin and Tesla coils ever obtained those slow-moving "balls of fire" which are like ball lightning?

Radio Inspector H. C. Gawler, First District, announces that during the school term, September to June, amateurs may appear at the Custom House, Boston, Mass. for examination for amateur operator's license on any day of the business week except Thursday. Thursday is reserved for examinations for first grade commercial operator's license.

To Sept. 9th 1350 licenses were issued for amateur transmitters in the First District, the last call issued being 1FBV.

Harry J. Spruance, formerly of Montreal, Que., will confer a favor upon Lester M. Spangenberg, 25 So. 4th St., Lake View Heights, Paterson, N. J., if he will communicate with him. Last April Mr. Spruance advised 2ZM that his small phone set had been heard in Montreal, the letter being forwarded to 2ZM thru QST, and Mr. Spangenberg desires further light.

The East Side Y.M.C.A., 153 East 86th St., New York, announce the inauguration of a course in the Theory and Operation of Vacuum Tubes, under the direction of Mr. Elmer H. Lewis. The course consists of a series of lectures and laboratory experiments which cover this interesting subject in all its phases, embracing thirty-six class sessions of 2 hours each, 7:30 to 9:30 p.m. on Monday, Wednesday, and Friday of each week, the students being entitled, without extra charge, to all the privileges of the Y.M.C.A. The vacuum tube is playing a most important part in modern radio, and a thorough course in this fascinating work will be of inestimable value and interest to live amateurs, to licensed operators, and to the more advanced experimenter. We are very glad to see the action of the Y.M.C.A. in establishing this course, and sincerely hope it will meet with an enthusiastic reception.

There must be something to the business of running a rotary gap at synchronous speed. Many amateurs report that when varying gap speed in a variable speed motor, there is an adjustment which can be held for a few minutes which will greatly increase the radiation for its duration. Interesting possibilities here. It has been suggested that the occasional falling in phase which would occur in normal operation in many cases, might account for some of the swinging of our signals.

Mr. A. L. Groves advises us that two Marconi Class II bulbs connecctd with all elements in parallel, and used as a detector, will give somewhat stronger signals than a single tube. This is because the characteristic curve of tubes in parallel is steeper than of an individual tube. This would make a cheap amplifier as the only additional expense would be the double drain on the A Battery.

New operator at 9QJ, St. Louis. Mr. and Mrs. F. W. Forshey announce the birth of their son Leo Hadley Forshey on Aug. 30th. Congratulations, Fritz!

'Nother radio romance. B. P. Williams, 8EN, Pittsburgh, met, courted, and won as his bride Miss Marian Carson, of Springdale, Pa., sister of R. M. Carson, 8RQ, official A.R.R.L. operator on Trunk Line B in Pennsylvania. This lady has forsaken the musical comedy stage to marry a radio bug and doesn't know what an awful thing she has done—but she probably will this winter. The newspapers featured the story so that on their trip they were pretty well known by the hotel clerks, and 8EN mentions that it "sort of QRM-ed the party." Hi, Brother!

Mr. Arthur Batcheller, formerly of the Massachusetts Radio & Telegraph School,

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is now Chief Radio Inspector for the Port of New York, Col. Krumm having resigned his position to connect himself with the International Radio Telegraph Co., of New York.

Is anybody doing anything in the way of transmitting on a loop? The Editor wants some dope on the subject, please.

You fellows who want a little set to work around town—there is no excuse for going to all the trouble and expense of rigging up a complete set. A small buzzer is all you need: key and battery on the input, and aerial and ground to the armature and stationary electrode, being careful to eliminate the resistance of the windings from the aerial circuit.

Mr. Theophilus Johnson, Jr., ("Ted" to his intimates), Chief Radio Aide, U.S.N. Radio Advisor to Commander S. C. Hooper, Executive Officer in Charge, Director and Past Vice-President of the Radio Club of America, was recently married to Miss Hebe Helen Mattson, of Chicago. Mr. Johnson is an old-time amateur, his principal fad in the olden days being to connect up a three-slide tuner in a manner no one else could follow in a diagram. He had an important part in the organization of the radio aircraft service of the Navy during the war, and is the author of a very interesting paper entitled "Naval Aircraft Radio", recently presented before the I.R.E. We understand Mr. Johnson will have an important position in the radio section of the General Electric Co. He certainly has our good wishes.

Well, fellows, that "Grand Central Station" at New York surely got enough publicity in the August magazines, didn't it?

The AudioTron Sales Co. announce the completion of negotiations whereby the AudioTron is now regularly licensed by the Radio Corpn. of America as well as by DeForest, for all amateur uses. The AudioTron was first marketed in 1915 and has had a long hard legal battle ever since. The familiar two-filament tube has been hand-made, and with increasing demand new models are being prepared, to be of the single filament type mounted on the standard 4-prong base. In October this company contemplates marketing a gas content detector tube known as the AudioTron, a high vacuum tube for amplifier work to be known as the AmpliTron, and a 5-watt oscillator which will be called the OscilTron.

"Eureka" wants to know where 7I got his oscillating rheostat

Lou Pacent points out that his new trade-mark is a Hertzian oscillator and not a wedding ring, and he hopes nobody will mistake his advertising for that of a mail order jewelry house.

9AIK suggests the use of old phonograph "needles" as switch lever stops. Drill a hole a little smaller than the needle, and force them in.

New books received: "Wireless Telegraphy and Telephony", by H. M. Dowsett, M.I.E.E. 331 pp., 8½x5½, published by The Wireless Press, London and New York, 1920. A typically British textbook, designed to act as a connecting link between the elementary text and the advanced treatise, and in particular to meet the demand for book which can be used in sequence to Hawkhead & Dowsett's "Handbook". Particularly good chapters on atomic theory, and exceptionally complete chapters are devoted to the accurate measurement of voltage, current, resistance, capacity, inductance, frequency, dielectric strength, and decrement, and it will no doubt be of value to American readers in search of data on these subjects. The price is $3.50.

WOULDN'T IT BE WONDERFUL—

If 3RW didn't start every conversation with "QSA OM"?

If Ma could find her paraffine, now that she wants it?

If we could get all the apparatus we wanted by merely walking down town and paying for it? (From a North Dakota ham.)

If my dad would let me stay up at night as long as I want to? (Yep, Lil' Willie)

If the traction companies would supply us with 550 D.C.?

If NPL's arc was on Mt. Ararat with Noah's?

If John Barleycorn had a set? (He used to be good at sending out fits!)

If the O.M.'s cat got a bath?

If "wireless" was really what the name implies?

If 1SZ should forget to test his transmitter after 8 o'clock some night?

If NAF wasn't the training station for all the ham ops in the Navy?

David L. Moore, 1BBL, Farmington, Conn., gave to the world thru the Associated Press its first news of the S-5 accident, having copied the SOS of the S.S. General Goethals. It is said that naval officers at the Philadelphia Yard obtained their first knowledge of the accident when asked for information on the subject by the A. P.

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Conducted by Guy R. Entwistle

SPARK GAPS

THE proper selection of the spark gap for the primary circuit may decide the success or failure of the transmitting set.

Its function is to permit the condenser to become properly charged at one instant, and at the next instant release this energy for the creation of wireless waves. It also determines the amount of coupling that can be used with any particular installation. Thus we see it not only governs the character (broadness or sharpness) of the emitted wave but also its strength to a certain extent.

In general amateur practice we find three common types. The plain gap, the rotary, (synchronous and non-synchronous) and the quenched gap. The first type is used with spark coils and low powered transformers. It usually is made from two flat surfaces supported horizontally with a variable adjustment for sparking distances. Zinc, nickeled steel, aluminum, or coppper can be used.

A more common type is the non-synchronous or plain rotary.

Mechanically it consists of a rotor on which are fastened at equal spaced intervals, studs or electrodes. This is set in motion by any small motor of suitable size and speed. The connecting shaft must be well insulated if the rotor is all-metal. In some cases the rotor is made of bakelite or hard rubber which eliminates any necessity of shaft insulation.

Common spark frequencies used in radio are from 120 to 1000.

By frequency we mean the number of times PER SECOND anything occurs.

Hence when we say a rotary gap gives us a spark frequency of 300 we mean 300 complete sparks have occured in that second and each spark represents a COMPLETE DISCHARGE of the condenser in the primary circuit. Also, each complete discharge of our condenser creates a separate wave train of oscillations. Therefore spark frequency and wave train frequency are one and the same. The tone in our receivers is governed entirely by the spark frequency at the sending station.

Below is a table that will be found helpful in selecting the proper frequency, or number of studs for any motor of a given speed.

Before starting on our search let us refer to last month's article in which the subjects of high and low spark frequency were discussed. In general a resonant type transformer works best with a low spark frequency, while the non-resonant type lends itself to higher frequencies. Low frequency is around 200-400 while anything up to 1000 can be taken as high. 600 or 700 is the usual upper limit among amateurs.

	Low		High	
R.P.M.	Studs	Spark Note	Studs	Spark Note
1200	14	280	28	560
1800	10	300	20	600
2400	8	320	16	640
3600	4	240	8	480

Example—If the motor goes around 1800 R.P.M. and you have a resonance type transformer which works well around 300 for a spark frequency turn to first column and on the same line with 1800 in this column will be found 10 in the second column. Hence we need ten studs on the rotor at this speed, 1800 R.P.M., to develop the required frequency at the gap. Bear in mind this frequency we are now discussing has nothing whatsoever to do with the wave length. OSCILLATION frequency is the deciding factor in this latter case.

The two groups of figures will be found to be near 600 and 300 respectively, in all cases in the table. Departure from the table will not harm in most cases, provided the amateur bears in mind the connecting relation on which it is made; namely, SPARK FREQUENCY=R.P.S. x STUDS. R.P.S. can be found by dividing the REV. PER MIN by 60.

For a higher spark frequency, say 600, and the same motor speed, 1800 R.P.M., the second group of figures shows we need 20 studs on the rotor. Notice that twice the spark frequency requires just twice the number of studs for a motor of con-

(Concluded on page 48)

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MORE CRITICISM OF "PROF. BUGS"

2637 Garfield Street, N. W.,
Washington, D. C.,
August 19, 1920.

Editor, QST:

In the August number of QST in the unsigned article "To the Old Man and Others" several erroneous statements were made.

The first of these is that the watts input to an antenna is

P equals $I^2 R$

"where R is the radiation resistance."

This is incorrect. The value R given in this equation is not the radiation resistance but the total antenna resistance. This total resistance is composed of the radiation resistance, the ohmic resistance of the ground connection, and the antenna wires, and finally the resistance due to the defective dielectrics in the field of the antenna. It is this **total** resistance that is measured by the substitution method which is mentioned at the bottom of page 49. The method most emphatically does **not** measure the radiation resistance; in fact there is at present no good method of measuring this value.

Radiation resistance may be calculated by means of the formula

$$R = \frac{H^2 1600}{\lambda^2}$$

but the statement that the formula "is accurate enough for all ordinary results" is anything but correct. The formula is a very poor makeshift which we use for lack of anything better.

Furthermore it is incorrectly used here. The height H is not the full height of the antenna but the height of the center of capacity, a distance which is considerably smaller than the antenna height unless the top is very large in proportion to the lead. In amateur antennas the top is not much longer than the lead. As the term enters into the equation in the second power the value of radiation resistance obtained by "Prof. Bugs" is very much too large.

The radiation resistance is here of only passing interest since "Prof. Bugs" is concerned with the current that may be expected in the antenna of a one kilowatt transmitter, and this current is limited by the total resistance, not the radiation resistance alone. It is the total resistance, then, that should be considered.

The total resistance of the antenna may be conveniently measured by adding series resistance to the antenna circuit till the current is halved, when the added resistance equals the antenna resistance. The regular spark set may be used for this purpose but the coupling should be loosened considerably. Precautions to be observed are that the series resistance is correct at the operating wave (very few resistances are correct at 200 meters) and that the antenna meter is correctly calibrated. Most amateur meters are very badly off—anywhere from 5% to 50%—at 200 meters.

The method of adding series resistance may also be used with an oscillator but the oscillator must be one which has its own tuned circuit which is coupled very loosely to the antenna so that only a very small part of the possible output of the tube appears in the antenna. The ideal condition is that no appreciable change be produced in the current in the closed oscillatory circuit when it is placed in resonance with the antenna circuit. With an oscillator of any ordinary size this means that the antenna current will be quite small so that a thermo element and galvanometer will be needed to measure it. Such a combination is normally a current squared instrument, hence the deflection with half current will be ¼ that of the full current.

Where the substitution method proposed in the article under discussion is to be used, a precaution must be observed which the writer of the article probably had in mind but did not emphasize. Both the substitution method and the series resistance method depend upon the assumption that the e.m.f. produced in the circuit under measurement remains constant. This condition is easy to meet in the series resistance method. In the substitution method the only sure way to obtain the same e.m f. in the dummy circuit as in the antenna circuit is to use the same coil, first as the antenna coupling inductance and then as the dummy inductance, the oscillator or spark set primary coil being kept at the same distance as before. In case an antenna loading inductance is used it must of course be used at the same position in the dummy circuit.

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Measured by the substitution method the antenna at 1AW has a resistance of 5 ohms at the operating wave length, the radiation resistance being a part of this. A current of ten amperes in this antenna would represent an input of

$10 \times 10 \times 5 = 500$ watts.

This is a large, but not impossible, input for a one kilowatt set—always assuming that it is possible to build a 200 meter, 60 cycle set which will have an input of one kilowatt. Like Mr. West, I would like to see such a set.

"Prof. Bugs" states that the value of the resistance used in the dummy circuit may be measured on a Wheatstone bridge. This is correct only if the measurement is made at the operating frequency, the bridge is one designed for radio frequent measurements and the resistance used as a standard is correct at these frequencies. As stated before, very few resistance boxes are even approximately correct at 200 meters.

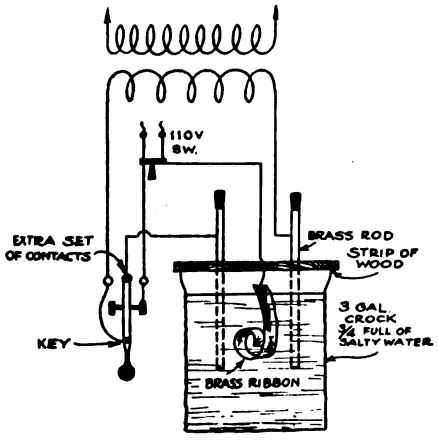
S. Kruse.

ELIMINATING BLINKING

3483 West 98th St.,
Cleveland, Ohio,
August 16, 1920.

Editor, QST:

I noticed in the August edition an article on light blinking. I am using a simple hook-up which completely does away with this trouble. A separate set of contacts must be placed at the rear of the key, one on the base and one on the lever and hooked up according to the diagram.



Procure a three or four gallon crock, fill it three-fourths full of salty water. Cut a strip of wood a little longer than the diameter of the crock, drill two holes three inches from the ends and slip some brass tubes or rods in these. Have them fit snugly so they can be adjusted. Have the wire connecting the brass ribbon hang over the wood strip so it can be slid back and forth for adjustment. With this hook-up the transformer voltage can be regulated and also the light blinking stopped.

Yours truly,
Arthur Schulder, 8AGB.

SIMPLE RADIOPHONES

251 Union Ave.,
Rutherford, N. J.,
New Jersey,

Editor, QST:

Most of the articles one sees in the electrical publications on Radio Phone Transmitting Sets have to do with the use of a generator or rectified A. C. to deliver the plate current, but the price of these instruments and their scarcity makes it impossible for most of us to get them, although most amateurs would like to have a Phone Set working.

A few weeks ago I hit upon the idea of using "B" batteries and getting the desired voltage in that way. I am using 5 standard "B" batteries delivering 110 volts to the plate of the vacuum tube. I use a very simple feedback circuit, the center connection on the secondary running to the filament. This circuit has been published many times so I will not give it again. I put up the set mostly to work with fellow amateurs in my own town. It worked fine, voice QSA on galena within a radius of two miles. A few nights later I was working with a friend when an amateur in Montclair called me and said he was getting me fine. That is about 7 miles from Rutherford. I was very much surprised and pleased to know my signals were carrying that far.

A few days ago 2WB in Bay Ridge, Brooklyn, put up a similar phone using 150 volts on his plate circuit. He is about 20 miles distant and I get him very QSA here, coming in at times almost as loud as another amateur in New York City using three tubes and radiating over 1 amp. 2WP gets me very good using a two step amplifier, signals being heard on the second floor.

It only took me about an hour to rig up this set, and I think it would pay any amateur to try it. I can use it with buzzer modulated, voice modulated, and straight CW. A small hot wire ammeter reading from zero to point five is needed in the ground lead so as to know the best adjustment. I am radiating 100 milliamperes on 325 meters.

I hope this will be of interest and help more amateurs to get CW sets working—we need them badly for local work.

If anyone hears 2MW, please let me know, as I would like to get the range of this set.

Very truly yours,
Harry B. Wattson.

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FOURTH DISTRICT PEP

105 Vineville, Ave.,
Editor, QST: Macon, Ga.,

I noticed a few days ago in the July "Strays" that it might be wonderful for the 4th district to show a little more pep. Ain't it the truth, OM? Things have looked pretty bad during the last season and seemed to get worse instead of better.

During last spring, I was one of the operators at 4YA, Ga. Tech. in Atlanta, and I had a pretty good chance to get a line on southern conditions. Here is how it looks to me. We can take messages from the northern and north-western stations (if they will repeat enough for us to copy them through the din) but when these messages get to Atlanta they have to stop or else go forward through Mr. Burleson's department. Even then, when two or three messages come back marked "Party Unknown", it gets a little bit discouraging.

I have often wondered just what kind of an opinion Mrs. 8ER and several of the others have formed about us fellows down here. Don't expect that it is anything complimentary but it just couldn't be helped. We have a pretty good come-back at them, though, that just about evens up the score. One of our Atlanta men sent several messages to his mother who was very sick in a northern hospital and not one of them ever got through to her. We would give the message to some station and then hear it forwarded to the next man about ten days later. That was the last we could ever hear from them and out of about six messages sent, not one was delivered. Looks like the 4th district wasn't the only one having hard luck so don't "'ride" us all the time.

Here is something else we have been wondering about. Haven't seen a division report from the East Gulf since April. Don't know why but we are not quite dead down here and even if you don't have much to print about us, I think you will hear from the East Gulf Division as soon as the weather gets better and we can begin to open up with a little DX work. We are still on the job down here in spite of the "static" and you will probably hear from us every time we get even a few minutes clear weather.

Our main trouble since the re-opening has been no route South of Atlanta. Friend 4AG in Athens, less than 80 miles from Atlanta, could sometimes work 4AT and 4AO in Florida with some success but we at 4YA never could get through to them. I understand 4AO has sold his set and is not with us now but expects to get back in the game again next fall. It is not very often that we can work from Atlanta to Athens either. We consider conditions unusually good when we can do steady work over this short distance although both of us can do DX work right along. 4AE at Jackson has not been on the job as his work carried him to another town, but I think he will be back again too. It will be a great loss if we have to lose both 4AE and 4AO too.

Just a few weeks ago I worked 4YB, K. of C. in Savannah, and then exchanged messages with 4BQ in Rome. Neither of these stations came in very QSA but think we can work both easily from Atlanta with better weather. Both of these should prove very valuable in relay work.

Have never gotten 4AN in Boston, Ga., good except the night before I left Atlanta about three weeks ago. Tried hard to raise him then but he failed to get me.

There is a good station going up in Macon now, 4DA, and it should prove to be another valuable link in the relay chain. We would have heard from this station before if he had not been requested like some of our Northern friends to "just about buy the power company."

We should be able to "go west" easily from Atlanta as we were able to work 5YE, University of Mississippi, for some time and exchanged several messages with them. 5XA, Auburn, Ala., also began to come in good just before we had to close down in Atlanta but on account of extremely heavy static we could not work them more than just exchanging signals.

It would seem that with the stations we had this spring and with the number of good stations increasing during the summer that we should get busy and make our arrangements now for work next fall so we will be ready to work as soon as the air "clears up".

Say OM, here's a good one. One of our Atlanta members made a business trip up east a short time ago and while there called on a few amateurs in Boston and New York. During the conversation at a station near Boston, the owner complained of not hearing 8's and 9's and other DX stations. The man from the south looked the set over, changed a few connections, rigged up a grid leak, did a little more to the set and in a few minutes had Mrs. 8ER and some of her neighbors on the line. The northern man was of course delighted but as his visitor started to leave, innocently asked him when the south was going to wake up in the radio game. Hi Hi. Can anybody tell one that will beat this?

Just wanted to let you know that we were still on the map and trying to do a little work so will QRT now. 73.

Yours truly,
E. H. Merritt.

AN AMATEUR DID IT

Editor, QST: Chicago.

An instance when amateur radio was put to practical use occurred about 7:40 P. M., June 10th.

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U. S. Mail Plane No. 206, having been delayed in leaving Cleveland for Chicago, was due to arrive at Maywood Field about dusk. The following request was broadcasted from plane when near Chicago:

"QST U. S. Plane No. 206.
"QST U. S. Plane No. 206.

Any station hearing these signals please notify Maywood Field of the Aerial Mail Service that 206 is coming into Chicago. Please phone Maywood Aerial Mail Field."

This message was phoned as soon as possible, although some delay was experienced on account of difficulty in obtaining telephone number.

The newspapers of next day reporting the incident stated that message was received at several amateur stations but gave Great Lakes Radio Station credit for service rendered.

Attached you will find letter from Post Office Department acknowledging receipt of message and confirming facts as outlined above.

An indoor aerial was used for reception of message at my station.

Yours truly,
W. J. McGuffage,
6120 Evans Avenue.

Mr. W. J. McGuffage, June 26, 1920.
6120 Evans Avenue,
Chicago, Ills.

Dear Sir:

Receipt is acknowledged of your letter of the 16th inst., regarding wireless message received by you from United States Mail Plane No. 206, at your radio receiving station, on June 10th, and in which you ask confirmation of telephone message that yours was the first information to reach this field regarding the arrival of this plane. In this connection, I beg to advise you that departure of ships from one field for another are always telegraphed promptly when ships leaves field. The departure of plnae 206, on the 10th instant, was reported from Cleveland in the usual manner. The Chicago station is not equipped to receive wireless messages and the exact time of arrival of this ship could not have been communicated direct to this field. I desire to thank you, therefore, for the service rendered in that instance.

Respectfully,
A. R. Dunphy,
Manager.

ULTRA-ULTRAUDION.

East Orange, N. Y.,
March 11, 1920.

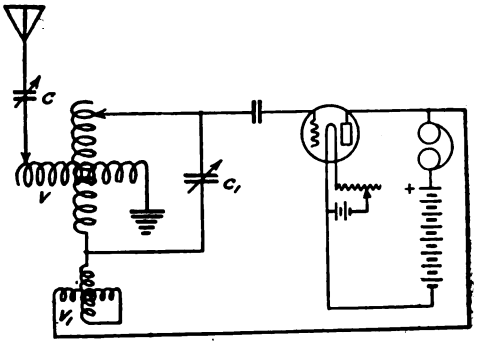
Editor, QST:

I am enclosing a simple circuit that works great.

I feel sure that the many readers of QST will be "tickled to death" with the results obtained by using it.

It is an adaption of the Ultra-Audion circuit. The Ultra-Audion hook-up is all right, but—I've added another variometer, V1, which increases its efficiency by at least 50%.

Trouble with the straight Ultra-Audion is that the degree of regeneration obtained is not readily controlled. By varying the coupling in the variometer I've added, ANY DEGREE of amplification can be obtained. And it's got them all stopped for radio phone reception!



V is a tapped variometer, Sears Roebuck, SCR-54.
V1 is an untapped variometer wound with very heavy wire, preferably Litz.
C is a 43-plate variable condenser.
C1 is a 23-plate variable condenser.
G.C. is, of course, the grid condenser.

I trust that this will find space in an early issue of your magazine and wish QST abundant success.

Very cordially yours,
G. N. Garrison.

ON REDUCING INTERFERENCE

San Francisco, Cal.

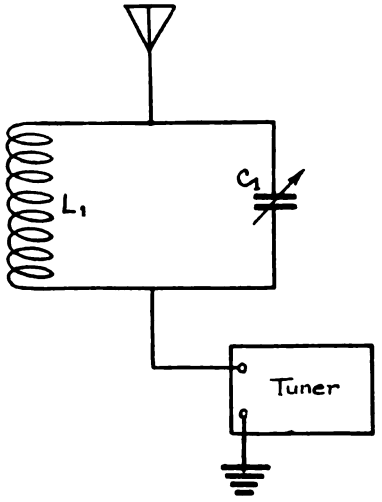
Editor, QST:

A great deal of complaint has been noticed from the amateur field at large, and especially from those situated in the near vicinity of the 600 meter shore stations, that these stations cause untold trouble due to "broad" (?) waves. Possibly with the old 60 cycle non-synchronous set, or a straight gap set in use this would be perfectly logical, but how many ever gave a moment's thought to the fact that this apparent broadness might be due to a broadly tuning receiver? Not many, I warrant. It is perfectly ridiculous to claim that a naval or commercial station using a modern 500 cycle quenched gap transmitter is, or can be emitting a broad wave, if it is properly tuned and, as the decrement of such stations often is as low as 0.03, which is really extremely sharp, and it is believed that this is only the natural antenna decrement, due to its resistance, rather than to any decrement due to a re-

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action between the circuits. If interference is caused on waves differing from the operating wave of the receiver, it is really self-evident that it is the fault of the receiver itself, and not that of the transmitting equipment. (This is aimed particularly at the ones who claim that NAH and NPG have broad waves on quenched sets).

Now, with proper adjustment, the receiver can be adjusted so that there is no interference possible, provided the undesired wave is really of one single frequency (wave-length) and has no bad harmonics. The accompanying diagram shows a circuit by which this may be accomplished.



The cut represents a regular receiver, which may be of any common type, regenerative or otherwise, which is indicated by TUNER. The inserted series circuit is the thing that does the trick, and it **does not** have to be adjusted or fooled with, once it is connected and adjusted properly.

This circuit, called variously a "bug", "trap" or "filter circuit", is nothing more or less than a combination of capacity and inductance, represented by L_1 and C_1, connected as shown, in the antenna lead of the receiver. This circuit, as can be readily seen, consists of a simple tuned circuit, the wave-length of which depends entirely on the values of the inductance and capacity connected across it. THIS MUST BE TUNED TO THE WAVE OF THE SIGNAL IT IS DESIRED TO ELIMINATE IN THE RECEIVER. At first glance, this seems strange, and unusual, but its explanation is as follows; if we have a tuned circuit, composed of capacity and inductance, this circuit will have practically zero resistance to any current of a frequency different than that the circuit is tuned to (i.e. its natural period), but to its own frequency the resistance will be infinity, or in other words no current will pass through it at all. Now if such a circuit is connected in series with the antenna of a receiver, all the oscillations of different frequency than that the circuit is tuned to will pass through it freely, and will excite the tuner in the usual manner; if, however, oscillations of the frequency of the series circuit impinge on the antenna, and travel down the lead into the receiver, meeting with infinite resistance, they will be stopped, and the interference eliminated.

Practically, the inductance L_1 and the capacity C_1 may be almost anything within reasonable limits, provided the wave-length of the undesired station is known, as it generally is. The inductance may be a simple coil of wire without taps, on a cardboard tube, and the condenser may be a standard variable of any well known type, or the old long-forgotten tuning coil may be dragged out of the dust in the garret, and connected in circuit with a small fixed condenser. For 600 meters or thereabouts, if no old material is available, however, the "trap" may be constructed as follows:—take a cardboard tube, say 3" in diameter, and wind about 45 or 50 turns of No. 20 wire on it. Shellac, or paraffine, or otherwise secure the wire in place. Now connect a variable condenser across it, and connect a crystal detector across the terminals of the inductance, with a pair of telephones in series, in the manner which you ordinarily connect the detector in a wavemeter. Now excite the trap with a buzzer driven wavemeter, and tune to the wave wanted. Now disconnect the phones, and detector, and connect the trap in the antenna lead as shown, and lo! the QRM has vanished. For other wavelengths other coils must be used, or a honey-comb coil, or in fact any inductance and capacity which will tune to the undesired wave-length will be all that is needed. Never use too large a condenser, however, but rather use a larger inductance. It is not desirable to exceed 0.003 capacity at most in the condenser.

Different traps may be made, and connected in series, if more than one station is interfering with reception at any one location, and if properly constructed, so that no extraneous inductances or capacity are introduced into the trap (always use the shortest possible leads) there will be no loss of the desired signals, or leakage of the undesired signals into the receiver, although a difference in the adjustments in the tuner primary circuits will in practically all cases result.

Yours truly, D. B.

(Note: We certainly cannot agree with our correspondent's statement that interference from naval or commercial stations is generally due to imperfections in the receiving equipment. How does he account for this interference when obtained on a

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modern short wave regenerative receiver, which tunes sharper than any other tuners we know?

We believe it is true that there will be no interference on 200 meters from a quenched transmitter on 600 meters when the latter is properly adjusted. The trouble is that they are often improperly adjusted. Some of these sets have arrangements for wave-changing which do not perform all the necessary actions, such as coupling corrections, that last shade of fine tuning necessary in a quenched set, etc. These are supposed to be done by hand, and often aren't. Others of these stations seem to have been tuned by people who were far from knowing their business. In others the inspector's tuning has been disturbed. At any rate we know beyond question that some of these stations have been causing unwarranted interference on amateur waves. Chicago amateurs recently complained officially regarding NAJ, we understand, and upon investigation it was discovered that on its three short waves the decrement of this station exceeded the legal .2. NRH was similarly found to have a decrement of .237, due to mistuning, and was corrected to .065. At NAM, a 5k.w. 500 cycle set, the trouble is from another source. The authorities are co-operating and investigating the trouble. We understand a strong wave is radiated by that station on almost exactly 200 meters, although the decrement is but .04, and exists as about 10% of the total radiation on 600 meters, and about 8% on 952 meters. It has been discovered here that the trouble is due to re-radiation from the towers, and steps to correct this are now being taken.

We suggest that clubs in localities experiencing unwarranted interference from Navy stations take up the matter with the Naval Communications Service, Washington—we know they will gladly co-operate.

Regarding our correspondent's QRM eliminator, we believe it will work in the case of forced oscillations where the transmitting station is very sharply tuned, but like all other devices of this kind it is ineffective against the components of the interfering energy which represent other than its resonant frequency—it is helpless in the case of a broad wave. We can hope, however, that it will be of much help to amateurs troubled by forced oscillations from a nearby powerful station.—Editor.)

BLINKING LIGHTS

Cambridge, Mass.,
August 21, 1920.

Editor, QST:

We have read with interest the communication in the August QST from Mr. M. E. Ross on blinking lights and wish to say from a manufacturers standpoint this method is unsatisfactory as radio transformers are not designed to stand a continuous load. If they were their costs would be considerably greater.

The most satisfactory way to eliminate blinking lights to have a double contact key which when down closes the circuit into the transformer and when up closes the circuit through the resistance of sufficient value to draw an equal amount of current. The reason for using resistance instead of an inductance is to eliminate arcing at the key.

By the above method blinking lights are eliminated by making the "blink continuous."

Very truly yours,
ACME APPARATUS COMPANY,
per C. F. Cairns.

(Note: Readers are requested to see a letter entitled "Eliminating Blinking", in this section.—Ed.).

LOG SYSTEM

34 Hobart Avenue,
Summit, N. J.

Dear Eddy:

In the last issue of QST I noticed that you wanted to hear from some of us boys on the subject of keeping a good log. I won't guarantee that it is a good one, but it certainly works great at my station.

A note book is kept with 8 ruled divisions; they are labeled; Date, Time, Call, Working, Amplitude, Secondary Adjustment, Primary adjustment, and Amplification, respectively. When a station over 100 miles is heard these divisions are filled out accordingly. At the end of the month these records are all gone over and all new stations heard that month are listed individually on a card about the size of an ordinary post card. The stations call is placed in large letters at the upper left-hand corner. These cards are ruled the same as the note book with the exception that there are only five divisions labeled Date, Time, Working, Amplitude and Amplification respectively. The adjustment is placed in the upper right-hand corner. These cards are then filed according to districts and alphabetically in each district. A complete personal record and adjustment of every DX station heard is then always on hand.

When a fellow wants to know if I have heard his call, one look at the records will find out whether he has been heard or not. The complete data can then be sent to the station, without the least bit of trouble

It also comes in handy when listening for a certain station. By means of the adjustment record the exact adjustment of the receiver can be ascertained and there is no need of constantly tuning over a wide range of wave lengths.

I have been using this system for quite a while now and I find it a great help.

Yours truly, I. R. Groves, 2DX.

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THAT UNKNOWN PHONE SET

Camp Lewis, Wash.

Editor, QST:

I saw in your last issue an article about a phone set 80 miles south of Tacoma with call PF1. This is a misunderstanding. That set is about 18 miles south of Tacoma and the call is CL1. CL-one...—.? It is the radio phone set of the 59th Regiment, 31st Brigade, C. A. C. I am at CL2, the brigade station, 31st Brigade Headquarters Detachment. We also have BI4 of the 14th Balloon Co., also a radiophone. BI4 and CL1 have SCR-67 Western Elec. sets. We have two E-10-bis French sets at CL2 and one E-3-bis French radiophone, and some W.E. sets on the way. Our sets are for field work up to 12 miles and work fine for that distance but no good for long distance. The SCR-67's are good for 60 miles to a similar set, but with good aerial and good weather can be stretched to about 300 miles. We have a spark set here at CL2 and are waiting for condenser and short-wave receptor. Then we are going to talk with amateurs.

Yours in the ether,

Neville R. Benoit, 7BC.

MORE ABOUT XAJ

Mt. Morris, Ill.,
August 17, 1920.

Editor, QST:

Just read 8BQ's letter on XAJ, Tampico. Was down there myself about the middle of May and noted some queer happenings. We were leaving the Panuca River, still in sight of land, and I had some traffic for him. Called him twice, the second time on about one-half k.w. Couldn't get him at all, but was hearing NAT and NAY through some fairly heavy static. Was called by another ship who said QSQ—XAJ. I then called him again on one-half k.w. and he came in then aroaring. He said he had answered both times before. My set and antenna were O. K. as evidenced by NAT on carborundum, also by test. Now why?

Yours,

E. R. Tilden,

THE JUNIOR OPERATOR

(Concluded from page 41)

stant speed. The same effect can be produced by doubling the speed and using the same number of studs.

It will be noted that the DIAMETER of the rotor has nothing to do with the number of sparks we get per second, or the frequency. It has, however, an important bearing on the efficiency of the gap. In general, the larger the diameter of the rotor the better. Mechanical difficulties prevent most of us from increasing our rotor size indefinitely.

The amateur will be well repaid for any labor along this direction. The reason is as follows: When the moving electrode, or stud, approaches the stationary stud, the spark jumps to meet it. At the next instant the two studs are opposite and an instant later are becoming separated. During all this time the primary circuit is virtually closed and the energy surging back and forth. At one time it is being passed over to the secondary and at the next moment is being passed back to the primary. This is against all principles of efficiency. Once it has been passed over to the secondary it should remain there until it has been converted into radiation. Hence we see the necessity of shortening the time interval at which our two electrodes are in use. Or, in other words, shortening the life of "spark" in the primary.

The next question is, how can we do this? Without going into mathematical details which are out of place here, the answer is to increase the DIAMETER of your ROTARY. 1AW has a rotor around two feet in diameter. NAA's is around FIVE feet. Those who know what is meant by LINEAR VELOCITY will understand the importance of a large diameter.

Another important item in the design of a rotary is the proper shape of the studs. The sparking surface should be narrow. Both stationary and moving electrodes (Studs) should be mounted horizontally, similar to the blades of a water wheel. This helps in shortening the life of the spark.

In practice it is impossible for the amateur to send out a single wave with a rotary and still accomplish any distance. But the Government has fixed the strength of the other waves not to exceed TEN per cent of the energy of that in the main wave.

It is due to this FEED BACK from primary to secondary that we have to use such LOOSE coupling. This means a loss of energy for our antenna circuit. Thus we see the type of gap used governs the amount of coupling used. This in turn determines the amount of energy we succeed in passing over into the antenna which, as we know, determines the distance to which we transmit.

One of the disadvantages of the rotary is that is makes much noise. This can be overcome by enclosing it in a box packed with felt or any other material that will absorb the vibration.

Many manufacturers advertising in QST offer complete rotors and stators which will make a good rotary for the amateur.

The synchronous gap will be taken up next month.

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CALLS HEARD

On account of the vast quantity of calls reported we must ask your co-operation in the following.

(1) List the calls on a separate sheet of paper—do not embody them in a letter.

(2) Arrange by districts from 1 to 9, and alphabetically thru each district; and run them across the page, not down a column.

(3) Put parentheses around calls of stations also worked.

(4) Omit initial or other unauthorized calls.

(5) State the period covered by your report.

1AAC, FRAMINGHAM, MASS.
1AW, 1BM, 1FQ, 1FT, 1QP, 1RZ, 1SZ, 1TS, 1YB, 1KAY, 1PAM, 2AD, 2BB, 2BH, 2CK, 2DA, 2DC, 2EW, 2BK, 2GE, 2GU, 2JE, 2JP, 2JU, 2GM, 2LL, 2MEK, 2OA, 2OM, 2RG, 2RL, 2RR, 2SJ, 2TO, 2TF, 2WN, 2XJ (spark and tel.), 2YN, 2ZL, 2ZA, 2ZC, 3CF, 3CV, 3DH, 3EV, 3EW, 3HJ, 3NN, 3ZM, 4AL, 4LF, 8DA, 8BU, 8BP, 8IN, 8JU, 8EN, 8XU, 8WY, 8NN, 9AU, 9ZN.

8MT, UNIONTOWN, PA.
1AN, 1AU, (1AW), 1CC, 1GB, 1GR, 1HAA, 1IZ, 1NC, 1RN, (1YB), 2AE, 2BM, (2BK), 2BN, (2CS), 2CH, (2DA), 2EF, 2ET, 2GC, 2GL, 2IK, 2JA, 2JE, 2JM, 2JU, 2KM, 2NB, 2XJ Telephone, 2RB, 2ST, 2VA, (2XX) Telephone, 2ZS, 2ZL, 3BH, 3BT, (3BZ), 3DZ, 3EA, 3EF, 3EI, (3EN), (3EW), 3GA, 3GO, 3GX, (3HJ), 3IB, (3MU), 3MV, (3NB), 3NK, 3NV, 3PC, (3ZA), 3ZM, 4AE, 4AL, 4AN, 4AM, 4AT, 4CC, 4DD, 4DO, 4EJ, 4YA, (YB), 5DA, 5AN, 5AQ, 5HQ, 5KA, 5GZ, 8AAM, (8ACF), 8AP, 8AJ, 8AZV, (8BB), (8BP), (8BQ), 8CH, (8DA), 8DC, (8DH), (8DI), (8DR), (8DS), 8DU, (8DV), 8EC, (8EF), (8EN), (8EO), (8ER), (8EJ), (8FD), (8FS, 8GA, (8GC), 8GJ, 8GP, 8GQ, 8HA, 8IF, 8IK, (8IN), 8INN, (8JQ), (8JJ), (8LA), (8LJ), 8MD, 8NP, 8OC, 8OI, (8OJ), (8PW), (8QG), (8RS), (8SP), 8VC, (8VQ), 8WA, 8WG, (8WR Telephone), (8WY), 8XA, (8XK Telephone), (8XU), (8YI), 8RQ, 8GS, 8FO, 8NG, 8ZNC, 8WB, 9FG, 9KV, (9OJ), 9TR, (9ZL), 9HR.

8NB, ROCHESTER, N. Y., May.
1AE, 1AS, 1AW, 1BU, 1CE, 1CK, 1CV, 1DQ, 1FW, 1GB, 1KA, 1KT, 1RZ, 1TS, 1YB, 2AA, 2AS, 2BB, 2BK, 2BM, 2DA, 2DR, 2EF, 2EH, 2GE, 2GR, 2JE, 2JU, 2KM, 2ME, 2OA, 2OR, 2QV, 2RB, 2TF, 2UE, 2WB, 2XJ, 2ZL, 3AN, 3BA, 3BE, 3BH, 3EV, 3FX, 3GO, 3GX, 3HJ, 3HR, 3HV, 3JR, 3KM, 3MK, 3NB, 3NP, 3NV, 3SQ, NSF, 4AG, 8AA, 8AJ, 8BB, 8BG, 8BM, 8BP, 8BQ, 8BU, 8CB, 8CC, 8CE, 8DA, 8DE, 8DI, 8DV, 8DZ, 8ED, 8EN, 8ER, 8FI, 8FO, 8FT, 8GQ, 8HH, 8IK, 8IL, 8JU, 8KW, 8LA, 8LW, 8MC, 8MT, 8MI, 8NF, 8NI, 8PA, 8PR, 8QJ, 8RC, 8RQ, 8RS, 8SH, 8TF, 8WY, 8XA, 8XK, 8XU, 8YV, 8ZM, 8ZW, 8AAN, 8ABG, 9CS, 9FG, 9MS, 9ZN.

1AW, HARTFORD, Aug. 9-28.
(1AS), (1CK), 1CM, 1FB, 1FV, (1JQ), (1QP), (1TS), (1BBH), (1BBL), 1FAQ, (1HAA), (1NAQ), 1VAD, 2BG, (2DA), (2DN), (2EF), (2JU), 2JL, 2JN, 2MB, (2NF), 2ND, 2OM, 2PV, (2TF), 3BE, 3BG, 3BZ, 3EH, 3HJ, (3LG), 3NB, (3OB), 3ZW, 8AD, (8BV), 8CH, (8DI, 8DY, (8EN), (8GS), 8IK, 8MT, 8NI, 8SH, (8WY), (8XK), 8ZC, 8ZW, 8ZY, 9HR, (NSF).

2YM, NEW YORK, August
1AS, 1AW, 1CM, 1DQ, 1FH, 1FV, 1TS, 1HAA, 3BG, C3L, 3EN, 3FG, 3FD, 3GV, 3GX 3HJ, 3JK, 3ND, 3RW, 3VV, 3ZA, 3ACS, 4BZ, 8BV, 8DA, 8DI, 8ER, 8LX, 8MI, 8NI, 8QO, 8ZW, 9ZN.

3GX, READING, PA., Aug. 28 to Sept. 8.
1AW, 1BM, (1DQ), (1PY), (1RZ), (1SZ), (1HAA), (2BK), (2GR), (2JU), 2JZ, (2NF), 2TF, 2WB, (3BZ), 3DL, 3EZ, 3FG, (3HG), (3HJ), (3KM), (3NB), 3RS, 3VV, 3ZW, (3ADH), 3AOF, 4CP, 4DM, 8CV, 8DV, 8EN, (8EV), 8GI, 8HG, 8JS, 8LX, 8MT, (8NI), 8QM, 8RU, 8SH, 8UO, 8XK.

H. POLLOCK, PAWTUCKET, R. I., August.
1AW, 1ES, 1CK, 1HAA, 1SZ, 1TS, 1VAD, 2OA, 2RK, 2RM, 3HB, 3HJ, 3KM, NSF, 8ER, 8HD, 8QM, 8XD, 9ZN.

2MN, BELMAR, N. J., June 11 to Sept. 5.
1AW, 1BBZ, 1BQ, 1CB, 1CZ, 1DQ, 1DY, 1FAQ, 1FV, 1FW, 1GAO, 1HAA, (1HO), 1IN, 1RZ, 1TS, 1VA, 3BZ, 3CZ, 3GO, 3HJ, 3VV, 8BV, 8DI, 8ER, 8QM, 8QV, 8WY, 8XK, 9AU.

1RY, CHATHAM, MASS., Aug. 30 and Sept. 4.
1AS, 1AW, 1CM, 1CZ, 1DQ, 1DY, 1ES, 1GAO, 1HAA, 1RZ, 1SZ, 2BG, 2BK, 2CT, 2DN, 2EL, 2JU, 2ME, 2MN, 2NF, 2OM, 2TS, 2WB, 2WZ, 2YM, 2ZL, 3BG, 8EN, 8JS, 8SH, 8XK.

8ME, BEAVER, PA., Past Year.
1AW, 2DA, 2ZS, 2ZV, 8AI, 8AO, 8ACI, 8BP, 8BV, 8DI, 8DK, 8ER, 8II, 8IK, 8MB, 8MM, 8TI, 8VM, 8XA, 8XU, 8ZW, 8ZX, 9CS, 9DV, 9ER, 9HD, 9HR, 9KF, 9ZJ, 9ZL, 9ZN.

CANADIAN 5BR, VANCOUVER, B. C., July 10 to Aug. 9.
(5AR), (5BK), (5BG), 5BJ, 6DP, 6FE, 6OH, 7AD, 7AH, (7BK), 7BU, 7CE, (7CU), 7CW, 7DA, 7DP, (7DS), 7FL, 7GR, 7IN, 7JM, 7NS, 7YB.

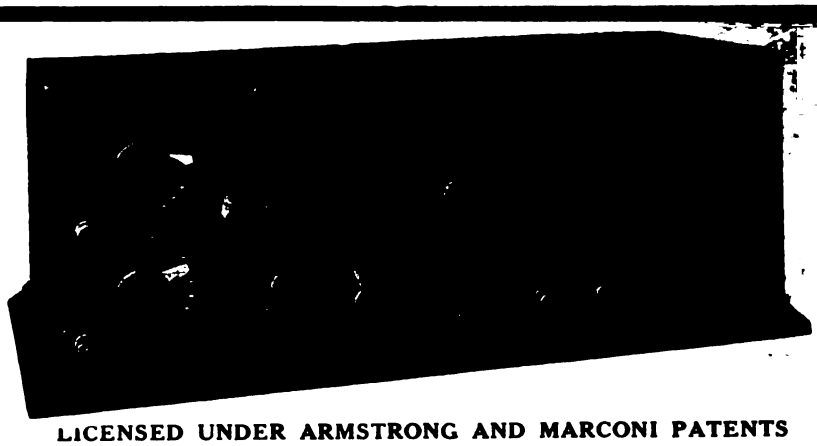
7CU, VANCOUVER, WASH., August.
(5BR), (6AS), (6AV), (6AR), (6BJ), (6BN), (6BQ), (6BR), (6CO), (6DK), (6DY), (6EA), (6EB), (6EJ), (6EP), (6EX), (6FS), (6GF), (6GR), (6IF), (6II), (6JD), (6JI), (6JM), (6JN), (6OC), (6OH), (6PQ), (6QR), (6SR), (6TC), (6ZE), (7AD), (7AN), (7BK), (7CE), (7CW), (7IN).

1TS, BRISTOL, CONN., July 20 to Sept. 1.
1AAU, C.W., 1AG, 1AK, 1AS, (1AW), 1AY C.W. and fone, 1BAY C.W. and fone, (1BBL), 1BL, 1BM, 1CK, (1CM), 1CZ, 1DBU C.W., (QST vy. QRA?), 1DQ, 1DR, 1EAV, 1EK, 1FAQ, 1FB, (1FBK) spk. and C.W., 1FQ, 1FV, 1GAO, (1GJ), 1GY, 1HAA, 1IAO, 1JQ, 1MJ, (1NAQ), (1NAT), 1OAL, (1QP) C.W. and fone, 1RZ, 1SN, (1SZ), 1UAW, 1XD C.W. and fone, 1XE, 1ZC, 2AJD, 2AJW, 2AMZ, 2BG, 2BH, 2BK, 2CE, 2CT, 2DA, 2DI, 2DN, 2EL, 2GR, 2HN, 2JN, 2JU, 2JZ, 2MJ, 2NB, 2ND, 2NF, 2NV, 2OA, 2OM, 2PE, 2PL, 2PZ, 2QR spk. and fone, 2RK, 2RM, 2SH, 2TF, 2VA, 2WB, 2WG, 2XJ fone, 2XO, 2YM, 2ZL C.W. and fone, 2ZM spk., C.W. and fone; 3BG, 3BZ, 3DS, 3EH, 3EV, 3FB, 3FG, 3FN, 3FR, 3GX, 3HJ, 3HX, 3MU, 3NB, 3OB, 3SJ, 3VV, 3ZA, 3ZS, 3ZW, 8BH, 8BP, 8BV, 8CG, 8DA, 8DI, 8DV, 8DY, 8EN, 8EW, 8FC, 8FW, 8FX, 8GS, 8GY, 8IK, 8IN, 8JS, 8JU, 8MQ, 8MT, 8NI, 8OY, 8QM, 8SH, 8VU, 8WY, 8XK C.W., 8YV, 8ZW, 8ZX, 8ZY, 9AP, 9AW, 9HR, 9ME, 9ZJ, 9ZN. ...—. —

8AD, BUFFALO, July 1 to Aug. 31.
1AW, 1CK, 1ES, 1FV, 1NA, 1XJ, 2AJW, 2CT, (2EH), 2JZ, (2JU), 2ND, 2NF, (2RK), 2TF, (2WB), 3FG, (3HJ), 3NB, 3NC, 3OB, 3ZW, 4GT, 8AJN, 8BW, 8CV, 8CH, 8CF, 8CB, 8DA, (8DI), (8DF), 8ER, 8EN, 8GY, 8GB, 8HS, 8LX, 8LF, 8MT, (8NI), 8RS, 8SH, 8XK, NSF, 9AD, 9AIS, 9ASH, 9HR, 9ZN.

(Concluded on page 52)

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9OX, LOUISVILLE, KY., July 1 to Aug. 31.
(NSF), 1AK, 1XJ, 2IL, 2XL (phone), 3BK, 3BQ, 3BZ, 3EA, 3VW, 4AE, 4KK, 5DA, 5YH, 5YS, 5ZG, 8AL, 8BP, 8CF, 8CU, 8DA, 8DH, 8DI, 8DR, 8DV, 8DX, 8DY, 8DZ, 8EF, 8 ER, 8GB, 8GR, 8IE, 8IK, 8IN, 8JJ, 8KN, 8LF, 8MC, 8MI, 8MT, 8NI, 8NL, 8NY, 8PP, 8RC, 8XK (I.C.W.) 8XL, 8YQ, 8YV, 8ZW, 8ZY, 8ZZ, 9AP, 9AT, 9ABL, 9ALS, 9BW, 9FL, (9HR), 9HW, 9IN, 9IT, 9KO, 9KU, 9LC, 9MH, 9MS, 9MT, 9NC, 9NQ, 9NZ, 9OJ, 9QJ, 9RM, 9WC, 9WK, 9WV, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZO, 9ZR, 9ZX.

1ES, BROOKLINE, MASS., August.
1AAU, 1AK, 1AW, 1BBL, 1BM, 1CBJ, 1CM, 1EK, 1FB, 1FQ, 1FV, 1GY, 1HAA, 1IAO, 1NAQ, 1OE, 1RZ, 1SZ, 1TS, 2AER, 2AJW, 2AMZ, 2BG, 2BK, 2BM, 2CE, 2CT, 2DA, 2DN, 2EL, 2GR, 2HN, 2JN, 2JU, 2JZ, 2NF, 2OA, 2OM, 2OU, 2PL, 2PV, 2RK, 2TF, 2VA, 2WZ, 2YM, 2ZM, 3BG, 3BZ, 3EN, 3EH, 3FB, 3FG, 3FR, 3GV, 3GX, 3HJ, 3HX, 3KM, 3MU, 3NB, 3ND, 3OB, 3PS, 3VV, 3ZA, 3ZW, 4CM, 8AD, 8BO, 8BP, 8BV, 8CF, 8DA, 8DI, 8DV, 8DY, 8EN, 8ER, 8GB, 8GS, 8GW, 8IK, 8LF, 8LR, 8LX, 8MI, 8MT, 8NI, 8QM, 8SH, 8WY, 8XK, 8YV, 8ZW, 8ZY, 9ZJ, 9ZL, 9ZN.

8LF, CRAFTON, PA., August.
1AW, 1AW, 1AAJ, 1CB, 1XD (phone), 1FB, (1FV), 1HAA, 1RK, 1UB, 2BG, 2BK, 2BM, 2DR, 2EF, 2EL, 2GN, (2JZ), (2NF), 2RK, 2TF, 2TS, 2WB, 2XJ (phone), (3AAP), 3BG, 3BZ, 3CZ, 3DC, 3DN, 3DS, 3FG, 3GX, 3HL, 3HJ, 3KM, 3NB, 3NU, (3VV), 3WN, 4FB, 5YH, 8ADE, 8AFL, (8BV), 8CB, (8CF), 8DA, 8DE, (8DI), 8ER, (8FD), 8GB, 8HD, 8IK, 8ZV, 8ZY, 9AD, 9AT, 9GB, 9GX, 9SH, 9ZJ, 9ZN.

CANADIAN 3FE, NAPANEE, ONT., Aug. 1 to 23.
1AR, 1AS, 1AW, 1BAY, 1BL, 1BM, 1GR, 1GY, 1HAA, 1NA, 1QP, 1RZ, 1SL, 1SZ, 2BG, 2BK, 2DN, 2EF, 2EL, 2FS, 2JF, 2JU, 2JZ, 2NF, 2PL, 2QR, 2RK, 2TS, 2WB, 2XF, 2XX, 2ZL, 3HJ, 3OB, 3ZA, 8AD, 8BO, 8BP, 8BV, 8CE, 8CI, 8DA, 8DF, 8DI, 8EN, 8ER, 8FD, 8FM, 8FN, 8GB, 8HA, 8HF, 8NI, 8RN, 8SH, 8WY, 8XK, 8YV,, 8ZJ, 8ZW, 8ZY, 9ZN.

2CT, BRONX, N. Y. C.
(1AW), (1FV), (1HAA), 2TF, 3BG, 3BK, (3BZ), 3GX, (3HJ), (3KM), (3NB), 3NC, (3ND), (3VV), 8BK, 8BV, 8CB, 8CH, 8DA, 8DV, 8LF, 8MT, 8TD, 8XB, 8XK, 8ZW, NSF, 1DQ.

3VV, NORFOLK, VA., July 15th to Aug. 15th.
(1AW), 1FV, 1PZ, 1RV, 2AAP, 2BK, 2CA, 2CE, 2CM, (2CT), 2EL, 2FG, 2HR, 2HW, 2JA, (2JU), 2JZ, 2NF, 2RK, 2TT, 3BA, 3BG, 3BL, (3BZ), 3CZ, 3GK, 3GR 3HE, (3HJ), 3HR, (3JK), 3KM, 3LG, 3MU, 3NB, 3PS, (3QQ), 3RK, 3VA, 3VP, 3XI, 3YK, 3YM, 3ZA, 3ZL, 5YH, 5YS, 7JF, 8BK, 8CF, 8DA, 8DI, 8DR, 8ER, 8GP, 8GR, (8IK), 8LA, 8PK, 8VV, 8YK, (8YV), 8ZW, 8ZY, 9ALS, 9CM, 9DG, 9GB, 9GX, 9HF, 9PM, 9RW, 9ZF, 9ZN, (NSF).

9AHC, ELLENDALE, N. D.
On one wire, one variometer for tuner, and galena:
9ADZ, 9BW, 9JN, 9LW, 9PI, 9XN, 9YG, 9ZN, 9ZX.

1NY, BELMONT, MASS., June 25 to Aug. 26
2BG, 2BK, 2DN, 2EL, 2GR, 2JE, 2JZ, 2NF, 2RK, 2SH, 2YM, 3BZ, 3HJ, 3NB, 3ND, 3VV, 3VW, 8DA, 8DV, 8LF, 8XK, NSF.

8ZY, DEFIANCE, OHIO, July 20 to Aug. 24.
NSF, 1AW, (2BK), 2EL, (2GR), 2RK, 2ZL, (3BZ), 3HJ, 3ND, 3LG, 5AO, (5YH), (5YS), 8AIM, (8BP), (8CF), 8CV, 8CD, (8DA), 8DC, 8DI, 8DF, 8DH, 8DV, (8EN), (8FI), (8GB), (8GS), 8GY, 8HJ, (8IK), 8IN, (8JJ), (8JU), 8NI, 8QJ, 8QO, 8SH, (8UO), (8WY), (8XA), (8XK), 8ZW, 9AAF, (9ALS), 9AE, (9AP), (9AX), (9HR), (9IT), 9KO, (9LR), (9NQ), 9PW, (9ZN), 9ZJ, 9ZL.

3AAR, NORTH GLENSIDE, PA., On Crystal.
1AW, 1HAA, 2NF, 2WB, 3BG, 3BQ, 3BO, (3DK), 3DR, 3EH, 3EN, 3FG, 3GH, 3GO, 3HJ, (3LH), 3MX, 3NB, 3NY, (3OT), (3PB), 3PG, 3PS, 3PW, 3QH, 3QQ, (3RU), 3RW, (3UF), 3VV, 3ZS, 3ZW, 3ABV, 8BV, 8ML, 8NI, 8SH, 8YV, 8ZW.

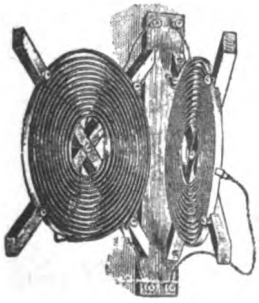
8TY, JAMESTOWN, N. Y., Aug. 1 to 21.
1AS, 1AW, 2AJW, 2BG, 2BK, 2CT, 2EL, 2JZ, 2NF, 2QR, 2UE, 3BZ, 3EN, 3FR, 3HG, 3HJ, (V. 2SA), 3NO, 3VV, 8ACN, 8AIJ, 8BP, 8BV, 8CI, 8CV, 8DA, 8EN, 8FI, 8GB, 8GS, 8IK, 8IN, 8JU, 8LA, 8LX, 8ML, 8MT, 8NI, 8QM, 8RQ, 8SH, 8WY, 8XK, 8YV, 8ZW, 9ZN, NSF.

9ZY, LA CROSSE, WISC., July 10 to Aug. 21.
5DW, 5ED, 5YH, 5ZZ, 8BP, 8BV, 8CF, 8DI, 8ER, 8FI, 8KV, 8XK, 8YV, 8ZY, 9AB, 9AU, 9AEK, 9AEH, 9AEQ, 9BW, 9CA, 9CS, 9EL, 9FS, 9GN, 9HR, 9KI, 9KO, 9LC, 9LR, 9NQ, 9OR, 9PB, 9PN, 9VR, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZT, 9ZW, 9ZX.

9AEU, DAVID CITY, NEBR., June 18 to Aug. 19.
5AL, 5AO, 5BT, 5CD, (5YH), 5ZL, 5ZP, 5ZV, 8CF, 8DC, 8ER, 8GB, 8IK, 8RB, 9AT, 9AU, 9BR, 9CA, (9EL), 9EW, (9FP), (9HT), (9IF), (9KO), (9LR), 9NQ, 9OX, 9QJ, 9QM, 9RY, 9SC, 9SY, 9VE, (9WI), 9YD, 9YO, 9YP, 9ZN, (9AEG), (9AEQ), (9AFX), 9AJN, 9AJS, 9AJX, 9AJY, 9ALO, (9ANF).

2DX, SUMMIT, N. J.
1AW, 1BH, 1DN, 1JN, 1LY, 1QN, 1TS, 1HAA, 1RZ, 1GY, 1OA, 1BBL, 1CCL, 1CK, 1DA, 2CG, 2QR, 2ADJ (fone), 3HJ, 3BB, 3EW, 3BE, 3CK, 3CV, 3ZA, 3ZS, 3MS, 3LZ, 3LY, 3EN, 3HG, 3KM, 8AU, 8BO, 8DA, 8DW, 8ER, 8EN, 8GB, 8HF, 8MT, 8NS, 8WG, 9WY, 8XK, 9ZN.

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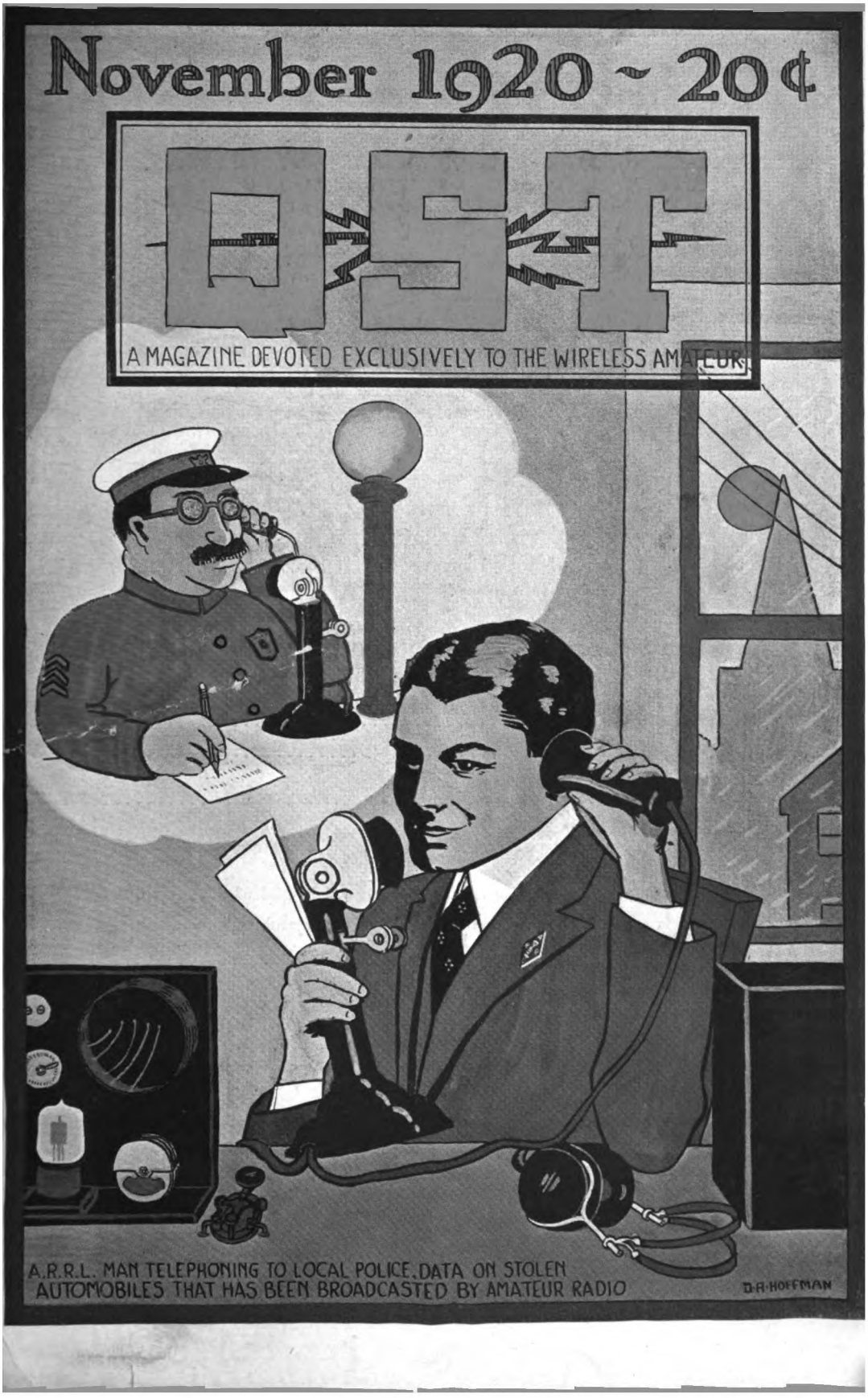
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QST

NOVEMBER, 1920

VOLUME IV No. 4

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QST
A Magazine Devoted Exclusively to Amateur Radio

The Bureau of Standards---A.R.R.L. Tests of Short Wave Radio Signal Fading

By S. Kruse

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Presented at meeting of the Radio Club of America, Columbia University, September 24, 1920

PART I.

THE Bureau of Standards—A.R.R.L. tests of short wave radio signal fading were run co-operatively by the Radio Laboratory, Bureau of Standards, and the American Radio Relay League for the purpose of gaining information useful in determining the cause of the swinging or fading of radio signals. The work was divided between the two organizations, the selection of stations and actual performance of the tests falling to the A.R.R.L.; while the work of general supervision, preparing the recording forms, correspondence, and the analysis of the results were done by the Bureau of Standards.

Test signals were transmitted by six stations each Tuesday, Thursday and Saturday night, from June 1 to July 17, 1920, inclusive. Five of the transmitting stations were A.R.R.L. stations. The sixth was the station at the Radio Laboratory of the Naval Air Station, Anacostia, D. C.

It is perhaps best to begin a discussion of this kind by defining the term "swinging" or "fading" of signals. This can best be done by example. Supposing that we are listening, at the Radio Laboratory in Washington to station 1HAA at Marion, Mass. 1HAA will call and be received with normal intensity, will begin the preamble of his message still at normal intensity, and then, as he starts to send the text, the signals rapidly become very much louder until within a few seconds they can be heard all over an ordinary room. Then as he proceeds the signals become fainter and may become so weak as to be unreadable or even inaudible for a number of words, and then again begin to become louder, so that by the time the station signs off, the signals are again very loud. It can readily be seen that this kind of thing makes communication very difficult, and on many occasions requires repetition time after time of a message which could otherwise be copied "solid" the first time. In short-wave work swinging is so prevalent that a standard abbreviation has been devised to inform the sending station that his signals are swinging, and at present, in amateur communication this abbreviation, "QSS", is heard quite as often as QRM and QRN, which mean respectively "interference" and "atmospherics," the other two worst difficulties encountered in short wave communication. It is then of interest to attempt to find some explanation as to the cause of swinging, with the possibility in mind that if we know the cause, there may be a remote chance of avoiding the difficulty. Swinging has not been much investigated in the past, for several reasons. It is primarily a long-distance phenomenon, that is to say, long-distance compared to the range of the station which is sending. Most commercial communication is done well within the range of the transmitting station where not much swinging is encountered. In addition to this, commercial communication is done on long wave lengths on which swinging is not very severe nor very rapid. At present, however, the use of short-wave sets is very much on the increase, not only in amateur practice but also by airplanes, in military work, and in low-power ship communication. It seems worth while to

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attempt to investigate fading at short waves particularly. Naturally, since our ideas as to the cause of fading are rather vague, an investigation depending on a network of stations (rather than one sending and one receiving station) would be the most instructive. The thought that data on the fading of radio signals can be secured by co-operation with a network of amateur radio stations follows at once, as it is here only that one can find a large number of well equipped short-wave stations whose operators are thoroughly familiar with the apparatus and also able to give time and effort to the performance of an investigation. Last spring, therefore, I suggested to Mr. L. E. Whittemore of the Radio Laboratory of the Bureau of Standards that we place before the American Radio Relay League a plan for a system of fading tests in which the A.R.R.L. stations would do the transmitting and receiving, while the supervisory and clerical work and the analysis of data fell to our laboratory. During the following week such a plan was worked out tentatively by Mr. L. E. Whittemore, Miss H. H. Smith and myself.

Laboratory tests of the method of recording the variations in signal intensity having shown that satisfactory results could be secured without the use of any instruments other than the regular receiving equipment, the Bureau of Standards then officially proposed the plan to the A.R.R.L. The plans were received favorably, especially as they offered an opportunity of finding out with some definiteness what could be done in the way of summer transmission with amateur stations. It has developed since that Mr. H. P. Maxim, and Mr. K. B. Warner, respectively President and Secretary of the A.R.R.L., had discussed a similar plan and were about to write to the Bureau when our letter was received.

The plans for the tests were completed at a conference in the Bureau of Standards Radio Laboratory on April 7 at which there were present: for the American Radio Relay League, Mr. H. P. Maxim, and Mr. K. B. Warner; and for the Bureau of Standards, Dr. J. H. Dellinger, Mr. L. E. Whittemore, and the writer. Commander A. H. Taylor, USNRF, in charge of the Radio Laboratory, Naval Air Station, Anacostia, D. C., as well as Dr. S. J. Mauchley and Mr. A. Sterling of the Department of Terrestrial Magnetism, Carnegie Institution, Washington, were present and offered valuable suggestions. The tentative plans were brought into working shape, and the sending stations agreed upon. Mr. Maxim and Mr. Warner offered the use of their station 1AW at Hartford, Conn., and Commander Taylor the use of station NSF at Anacostia, subject to the approval of the Navy Department. Commander Taylor's offer of NSF was opportune as there was no Washington station capable of good 250-meter transmission which was available for the tests. Both 1AW and NSF did excellent work in the test series, the transmission of the latter station being at times little short of phenomenal.

During the following weeks, Mr. K. B. Warner and the officers of the Traffic Department of the A.R.R.L. did much hard

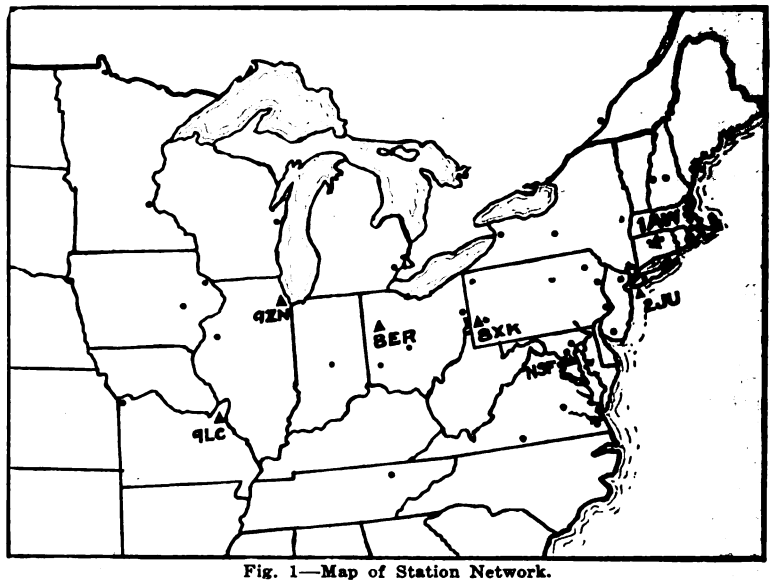


Fig. 1—Map of Station Network.

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work in selecting recorders properly located, and known to be well enough equipped as to apparatus and experience, who could also find time to take part in the tests.

The Station Network

The station network finally developed is shown in Fig. 1 where the sending stations are indicated by triangles with the call of the station alongside, while the recorders are indicated by circular dots. There were seven sending stations and fifty-one recorders.

Considerable criticism of the lay-out of the fading system was occasioned by the fact that only the northeast quarter of the United States was covered. There were reasons for this. There were almost no stations in the southeast part of the country and not a great many in the southwest. Also such stations as there are, report comparatively little fading. It seemed, then, that not a great deal of information would be obtained from the southern stations. In addition, there is a limit to the number of curves which can be analysed. The amount of work involved in handling the 1260 curves which were received can hardly be appreciated by anyone who has not attempted a job of this kind. The decision to confine the tests to the northeast was a unanimous one in the conference, and the results have shown it to be sufficiently correct. Experimentally the A.R.R.L. has run some nation-wide tests, largely to see what transmission conditions were. The reason for the wider spacing of stations west of Pittsburgh is a double one. To begin with, there are fewer stations west of Pittsburgh, and although it might have been possible to secure as many west of Pittsburgh as we did to the east, we did not think this was necessary. The winter range of stations in the Mississippi and Ohio Valleys is enormous compared to that of eastern stations. It did not occur to us that the Mississippi Valley summer conditions are enormously different from the winter conditions, while on the eastern coast ranges do not change particularly with the season. The station arrangement, therefore, which would have been satisfactory for a winter test was not so for the summer test. The western stations, 9ZN at Chicago and 9LC at St. Louis, were working under a considerable handicap, and it became necessary later to add station 8ER at St. Marys, Ohio, in an effort to secure more complete records.

Station Description—Senders.

1AW—Station 1AW at Hartford, Conn., is operated by Mr. H. P. Maxim, President of the A.R.R.L., and Mr. K. B. Warner, Secretary of the same organization. 1AW does not need much advertising. The station location is directly to the east of a large hill toward which the antenna is directive. There are no hills to the north or south and the country is level to the east for about two miles, after which it drops sharply to the Connecticut River. The soil is a heavy clay which is usually very wet in the winter. The station is surrounded by houses at a distance of about 75 feet, and there are trees in all directions except east. The antenna (Fig. 2)[1] is a bent fan of 17 wires spaced three feet apart at the high end and which is elevated 80 feet. All wires are continued through the spreader at the low end (elevation 50 feet) to the anchor gap at the transmitting apparatus which is located in the basement. The ground system consists of a network of buried wires as well as wires to ground rods and to all the metal pipes in the building. The radiating system has a resistance of 5 ohms and a capacity of 0.0011 microfarad. The sending set (Fig. 3)[2] is of the 60-cycle non-synchronous rotary gap type. Either an Acme or Thordarson transformer is used. In either case the input is about 780 watts. A Dubilier mica condenser of 0.01 microfarad capacity is used. The rotary gap is unusual, consisting of a shaft mounted in bronze bearings and carrying 4 metal arms revolving between two fixed electrodes. The rotor diameter is 15 inches and the speed 7000 RPM. It will be seen that while the spark rate is low the peripheral speed of this gap is very much higher than usual. Because of the high speed, or perhaps because of the compressed air traveling before the rotating electrodes, unusually good quenching is obtained so that close coupling with consequent high efficiency may be used. The normal antenna current is 5½ amperes and the decrement quite low.

The second station, 2JU, operated by Mr. C. J. Goette, is located in Woodhaven, L. I., near Jamaica Bay. There are no large buildings or trees in the neighborhood and the land is very level and slightly marshy.

The antenna is a four-wire L, 50 feet high, 85 feet long, and 10 feet wide. The ground system consists of a lead to the water pipe and an eight-wire fan buried directly under the antenna which is directive eastward.

The sending set (Fig. 4)[2] employs a United Wireless 1-k.w. open-core transformer with a 30,000 volt secondary. This transformer is well known among amateurs under the nickname of "the coffin," which its box resembles. The condenser consists of two Dubilier mica units in series. Each unit has a capacity of 0.014 microfarad. The oscillation transformer is the familiar "pancake". The rotary gap is of

1. Omitted. See July 1920 QST, page 35.
2. Omitted. See August 1920 QST, page 35.

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the gear type, having eight teeth, and is driven by a synchronous motor. A tone differing noticeably from that of a non-synchronous rotary is obtained.

NSF is the Naval Aircraft Radio Laboratory at the Naval Air Station, Anacostia, D. C. This station is under the direction of Commander A. Hoyt Taylor, USNRF. The transmitting set at NSF employs two electron tubes of the General Electric type P (Navy type CG916) operating in parallel. The filament and plate circuits are fed by the same motor generator set, and the total input to the tubes is about one kilowatt. The plate circuit supply is at 2000 volts direct current, the tone being produced by a motor driven chopper disc, which is placed in series with the key as a shunt to the grid condenser so that the tubes block and cease oscillating whenever either the key or the chopper opens the circuit. The circuit is the familiar one sometimes referred to as the Meissner circuit, both grid and plate circuits being untuned and coupled to the common antenna coil. The antenna is a multiple tuned one 75 feet high and 235 feet long with three down-leads, to the center one of which the sending set is coupled. At 250 meters the current in each down-lead is 2.3 amperes, thus giving a total of 6.9 amperes in the antenna.

For transmitting speech the above described set is used as a power amplifier, the grid being adjusted so that the set does not oscillate. To the grid is coupled the output circuit of a small aircraft radio telephone set. The antenna currents are nearly the same for telephone as when using the set in the ordinary manner.

8XK, the fourth testing station, operated by Mr. F. Conrad of the Westinghouse Electric and Mfg. Co., Pittsburgh, Pa, has become very well known during the past winter as one of the very few short-wave, high-power, ICW stations. The antenna system at 8XK consists of a 6-wire L antenna 120 feet long, suspended 50 feet from the ground over a similar counterpoise elevated 12 feet. A third network buried beneath the counterpoise is used as a ground.

The sending set (Fig. 5)[3] employs two transmitting tubes of a type similar to the General Electric Company's "U" type in the familiar circuit using one coil as a common antenna, plate and grid coil. The plate power is obtained from a ½-kilowatt 110-volt, 900-cycle generator from an airplane transmitter of the type employed on the NC planes. This generator is driven by a direct current motor at such a speed that the frequency is 700 cycles. A transformer steps the 110-volt supply up to 3000 volts which is applied to the plates of the tubes through a high-frequency choke coil. No chopper is necessary to secure an audible tone with this type of transmitter. The antenna current is normally about 5½ amperes. This is measured in the antenna lead.

9ZN—Station 9ZN at Chicago, operated by Mr. R. H. G. Mathews is perhaps the best known station in the network, 9ZN having operated under the present call since several years before the war and during the time doing excellent long-distance work. 9ZN is located in a vacant block on Sheridan Road within 30 feet of the sea wall of Lake Michigan. The aerial (Fig. 6)[4] hung between two steel towers is a vertical fan of 10 wires spaced 15 feet apart at the top and brought together near the station roof; all wires continue through to the antenna switch. The height of the fan is 95 feet. The grounding system consists of 28 wires 30 and 150 feet long buried inshore from the station. In addition, two 100-foot wires in the lake and a considerable number of ground rods near the station are used. The fundamental wave length of the antenna is 300 meters. For miles around 9ZN the country is some of the most level in the United States. The soil is very thin and is underlaid by many feet of sand, which is moist at all times. Two transmitting sets are used at 9ZN, one of which is a 500-cycle Telefunken set, (Fig. 7)[4] no detailed description of which is available. In the 60-cycle non-synchronous rotary gap set the transformer is a United Wireless open-core "coffin" similar to the one used at 2JU. The condenser is of plate glass in oil with about 0.008 microfarad capacity, the rotary gap a seven-point gear type driven at 3600 r.p.m. The antenna current at 9ZN is unusually high, about 8.7 amperes at 250 meters, and somewhat over 9 amperes at 425 meters. This is probably an indication of very low antenna resistance.

8ER—Station 8ER at St. Mary's, Ohio, is operated by Mr. and Mrs. Charles Candler. 8ER under its pre-war call of 8NH established a record, unequalled, I believe, by any other amateur station, of being heard in every state of the Union. The location of 8ER is unusually favorable. The country about St. Mary's is absolutely level. There are no hills for many miles in all directions. Even along the streams the land is very flat. There are no tall buildings near 8ER and only a few large trees to the east. All stations in this portion of Ohio are able to do unusually good work. The antenna is a six-wire L, 55 feet high and 65 feet long. The grounding system consists of a number of 7-foot ground rods also connected to the water

3. Omitted. See September 1920 QST, page 32.

4. Omitted. See January 1920 QST.

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pipes and to a cistern. No information is available as to the antenna characteristics. The sending set is of the non-synchronous type with 60-cycle supply, Thordarson transformer, gear type rotary, and glass plate condenser in oil.

9LC—9LC at St. Louis is the only one-half kilowatt station in the system. It is operated by Mr. W. E. Woods, who has become well known in connection with his work at the Otter Cliffs receiving station of the Navy Department and his pre-war work with station 9HS at St. Louis. There are no tall buildings or trees near 9LC. There is a street car line about 200 feet from, and parallel to, the antenna but no interference has been experienced. Not much is known about the topography near 9LC. In general the country about St. Louis is flat. The antenna is a five-wire

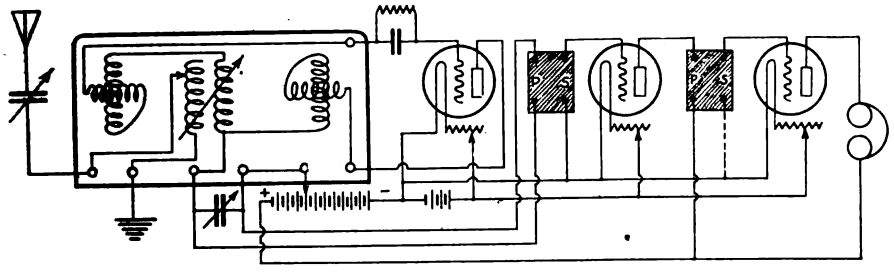


Fig. 8—Paragon receiving set circuit.

L, 55 feet high, 65 feet long, and 12 feet wide. The sending set consists of an Acme ½-kilowatt transformer, six Murdock condenser sections, of 0.0017 capacity each, connected in parallel and oil immersed to prevent brushing between leads. Either a quenched gap or a Benwood enclosed rotary is used. The Benwood rotary is a gear type gap enclosed in an air-tight aluminum case which serves not only to muffle the crash of the discharge but also provides a more favorable atmosphere for good quenching. The radiation is 4½ amperes at a decrement of 0.03. 9LC had, during the past winter, a range attained by very few one-kilowatt stations. During these tests, however, the unusually severe summer conditions of the Mississippi Valley did not give this station the opportunity to perform as well as some of the others in the system.

Station Description—Recorders.

With a single exception every recording station used a short wave receiving set of the type originally put on the market under the name of the Paragon receiver by the Adams-Morgan Co. The circuit of this set is shown in Fig. 8. The tuning of the primary circuit is accomplished by means of a switch on the inductance and a series condenser in the antenna lead. The secondary circuit is not tuned by means of a shunt condenser but by means of a variable inductor in series with the secondary. A great increase in sensitiveness is secured, as the ratio of inductance to capacity in the circuit is much improved over that obtained when using a shunt condenser. The plate circuit of the tube contains another variable inductor by means of which the degree of regeneration can be controlled. For spark or ICW reception the set is usually operated with the largest degree of regeneration which will not distort the spark tone. Far more regeneration can be used with low spark tones than with high. It is possible that this is the reason why a low spark rate has been found far more effective in amateur practice than the high pitches favored in commercial work. Almost without exception the recorders used a "soft" or gas tube as the detector and "hard" or high vacuum tubes for the amplifier. Minor variations of the circuit occurred, such as the provision of taps on the B battery as a means of varying the plate voltage of the detector tube.

The recorders, with few exceptions, used four or six wire L antennas about 60 feet high and 60 feet long. These were suspended by means of electrose insulators and, in most cases, copper wire, No. 12 or thereabouts, or 7 strand phosphor bronze, was used. The ground connections in most cases were to water pipes; in some cases to buried networks. A few recorders used harp antennas.

All of the transmitting operators except the one actually sending at the time acted as recorders. The stations which served as recorders only are listed below:

Additional Recorders.

1AE S. B. Young, 294 Ashmont St., Dorchester, Mass.
1AK H. C. Bowen, 168 Belmont St., Fall River, Mass.
1BG G. Faxon Shorey, Melrose, Mass.
1CK P. F. Robinson, 149 Hollis Ave., Braintree, Mass.
1CM H. B. McLane, 342 Union Ave., Laconia, N. H.
1DG Stuart Briggs, 94 Walnut Place, Brookline, Mass.

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1EK Robert D. Huston, 19 Nevens St., Portland, Maine.
1FB Lawrence C. Cumming, Prout's Neck, Maine.
1HAA Irving Vermilya, Marion, Mass.
1NAQ J. C. Randall, 23 Harrison St., Hartford, Conn.
1SN Wm. E. A. Dodge, Beverly, Mass.
1TS Donald H. Mix, 40 Stearns St., Bristol, Conn.
1YB F. L. Southworth, Sec., Dartmouth College Radio Assn., Hanover, N. H.
2BG A. J. Lorimer, 243 Mackay St., Montreal, Quebec.

A. R. R. L. FADING REPORT

Receiving station call_____Location_____Date_____

Time observations begin_____General reception this date_____

_____General character of strays

("static") this date_____

_____ Transmitting station call_____ Wave length _____m.

Weather, wind direction, and strength, indicated by check mark below.

Weather:	Wind Direction:	Wind Strength:
Clear	N	Calm
Cloudy	NE	Light
Rain	E	Medium
Snow	SE	Strong
Sleet	S	Storm
Fog	SW	
Lightning	W	
	NW	

SIGNAL STRENGTH RECORD. Indicate average strength for each letter by a check mark (✓) in the proper square below.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	
Very strong 9																											9
Strong 8																											8
Good 7																											7
Fair 6																											6
Rather faint 5																											5
Faint 4																											4
Just readable 3																											3
Very faint, unreadable 2																											2
Just audible 1																											1
Nothing 0																											0
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	

Fig. 9

Receiving Operator

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2BK C. E. Trube, 6 Livingston Ave., Yonkers, N. Y.
2FG F. H. Myers, 45 Albany Trust Bldg., Albany, N. Y.
2JE J. L. Eddy, Jr., 19 Washington St., New Rochelle, N. Y.
2OE S. L. Raynor, College Court, Freeport, N. Y.
2TT A. Rechert, 181 Waverly Place, New York City.
2YM YMCA Radio Club, 153 E. 86th St., New York City.
2ZM L. M. Spangenberg, 25 South Fourth Lake View, N. J.
3BZ W. T. Gravely, Danville, Va.
3EN T. C. White, Jr., 303 Riverview Ave., Norfolk, Va.
3JR H. A. Snow, 1656 Newton St., NW., Washington, D. C.
3NB Marcus Frye, Jr., Box 187, Vineland, N. J.
3SU A. B. Chism, 3729 M St., N.W., Washington, D. C.
3UA E. B. Duvall, 4004 Park Heights Ave., Baltimore, Md.
3ZA C. A. Service, Jr., Bala, Pa.
3ZS C. H. Stewart, St. Davids, Pa.
4AT O. A. Gulledge, Ft. Pierce, Fla.
5DA W. C. Hutcheson, Wind Rock, Tenn.
8AAN A. H. Benzee, Jr., 207 Sumner Pl., Buffalo, N. Y.
8ABI Harrison Daniels, 424 W. First St., Dayton, Ohio.
8BQ H. M. Walleze, 234 Vine St., Milton, Pa.
8CE R. C. Ehrhardt, 117 South Blakely, Dunmore, Pa.
8DA A. J. Manning, 252 McKinley Ave., Salem, Ohio.
8ER Mr. and Mrs. Charles Candler, St. Marys, Ohio.
8IB R. C. Higgy, 50 E. 18th Ave., Columbus, Ohio.
8WY Lord Bros., 531 Beach Ave., Cambridge Springs, Pa.
8XU Sibley College, Cornell University, Ithaca, N. Y.
8ZW J. C. Stroebel, Jr., Wheeling, W. Va.
9DT C. W. Patch, Villa St., Dubuque, Iowa.
9ET W. L. Tomson, 1163 North Broad St, Galesburg, Ill.
9NQ J. H. Burke, Galesburg, Ill.
9ZC J. A. Gjelhaug, P. O. Box 154, Baudette, Minn.
9ZJ F. F. Hamilton, North Alabama St., Indianapolis, Ind.
9ZL H. J. Burhop, Naval Radio Station, Manitowoc, Wisc.
WWV S. Kruse, Radio Laboratory, Bureau of Standards, Washington.
NSF L. C. Young, Radio Laboratory, Naval Air Station, Anacostia, D. C.

Operation

The network performed excellently throughout. After the first two days in which the usual delays occurred, no sending station failed to transmit its test schedule excepting on a very few occasions when the cause of the failure was beyond the control of the operator. The average distance of transmission was 400 miles. When it is considered that no station in the system used an input of over one kilowatt, that communication was at 250 meters where static is usually at its worst, and that the season was the most unfavorable for radio work, it would seem that only very meager results could be expected. Actually, however, an average of 26 recorders stood watch every evening and on no occasion were less than 20 on duty. This performance did not decrease during the period of the tests, the operators having the necessary interest to spend night after night at their instruments struggling with the uproar due to atmospherics. More than half of the schedules listened for were copied in the form of 1260 curves sufficiently good to be used in the final analysis.

The tests were all made at a wave length of 250 meters, under permits issued by the Radio Inspection Service, Department of Commerce. These permits were not necessary for the special amateur stations 9ZN and 8XK nor for the Naval Station NSF. The method of recording the variations of signal intensity is shown in Fig. 9. The test schedule consisted of the alphabet, each letter sent five times at a speed equal to eighteen words per minute, so that the alphabet required about three minutes for transmission. As each letter was received the operator indicated on this chart the intensity at which it was heard, so that when the schedule was complete a curve had been secured showing the swinging during the three-minute period. The intensity scale used may not seem especially satisfactory but its use was unavoidable since an audibility meter cannot be used satisfactorily with a regenerative receiving set, and as a matter of fact, the performance of the method is very good under severe tests. A laboratory test of the method can be seen in Fig. 10. Buzzer transmission of the actual schedule was sent through the primary of an ordinary coupler to the secondary of which two headsets were connected in series. The operators independently recorded the intensity of signals which was varied during transmission by altering the coupling. It will be seen that the curves are alike excepting as to the judgment of the average strength of the signals, so that one curve lies higher on the chart than the other. Many such tests were made, and in no case were the results less satisfactory than those shown on this chart. A test of the method under actual operating conditions is shown in Fig. 11, where Mr. K. B. Warner and H. P. Maxim, at 1AW, Hartford, Conn.,

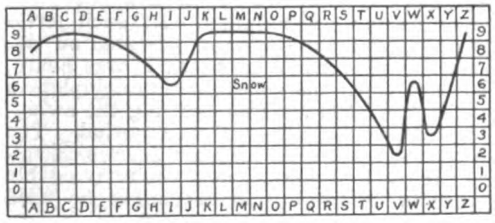
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recorded the signals from 2JU at Woodhaven, Long Island, simultaneously. The curves do not represent variations in received power since a receiving set operating near the critical point at which it begins to regenerate has something of the characteristics of a generating set and amplifies weak signals more than strong ones.

Method of Testing

The method of running an actual test was as follows: At 10 p.m., eastern standard time, all the sending stations listened for time from Arlington. At 10:10 the first station, 1AW, at Hartford, Conn., (Fig. 1) made a long QST call, saying repeatedly "Bureau of Standards—A.R.R.L. Fading Test." Both the call and the notice were repeated, then the station started to send the test schedule, repeating each letter five times as has been mentioned. All recorders able to hear 1AW tuned in during the QST, and thereafter left all adjustments alone and recorded signal intensity. After the schedule 1AW signed off.

Three tests were made each week, on Tuesday, Thursday and Saturday evenings, the transmission by 1AW coming at 10:10 p.m. eastern standard time, 2JU at 10:20, NSF at 10:30, 8XK at 10:40, 9ZN at 10:50, 9LC at 11:00. After being added to the list of senders, 8ER also transmitted at 11:00. The ranges are sufficiently small in the Mississippi Valley during the summer time so that no interference occurred between 8ER and 9LC.



Laboratory Test of Recording Method

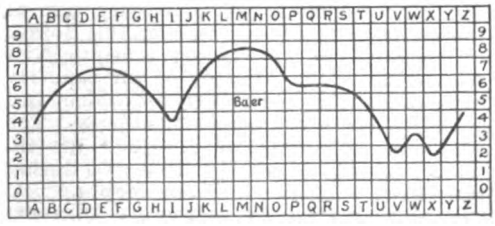
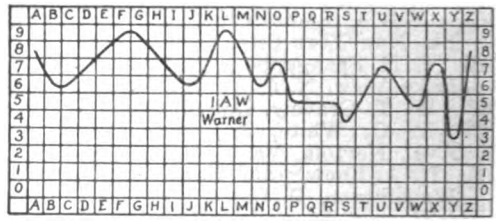


Fig. 10

On every test night each recorder who was on watch filled out one curve sheet (Fig. 9) for each sender that he could hear. At the close of the week he sent in all the sheets made during that week. The original intention to record atmospherics, by means of the various symbols shown, was abandoned as no recorder was able to note signal and static strength simultaneously. Weather conditions are shown roughly by checking the proper words at the lower left corner of the sheet. Recorders were asked to indicate on the lines above the chart, the swinging at various waves, general reception conditions on various waves, and any special conditions. Most of them did this very well and also used this space for indicating general static conditions during the evening. The exact method of recording varied, as it was modified during the tests by reason of improvements suggested by the observers. At first our impression was that the swinging would be very slow, hence the intention was to use a check mark for each group of five letters. This was not adequate as the swinging was often more rapid than could be so shown. Several observers suggested a different observation form in which one column was allowed for each letter, that is to say, five times as many columns as in the present form. This would have been good but clumsy; even the present form is exceedingly unhandy when large numbers must be analyzed. Another suggestion was that a continuous curve be drawn by moving the pencil slowly as the signals come in. This sounds well, but in practice is subject to violent errors when long slow fading takes place, as the temptation to keep the pencil moving in the same direction is irresistible when the curve has continued in the same direction for, say, 20 seconds. The result of this tendency, which appeared both in the field and in laboratory tests, is that slow

(Continued on page 37)



Transmission by 2JU - July 1, 1920

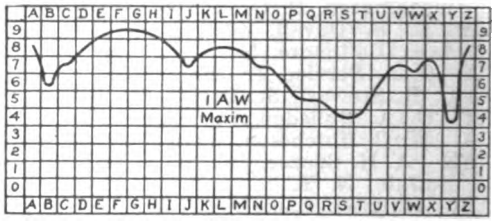


Fig. 11—Two operators receiving at same station.

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The Young Squirt's Second Epistle to The Old Man

By QRU

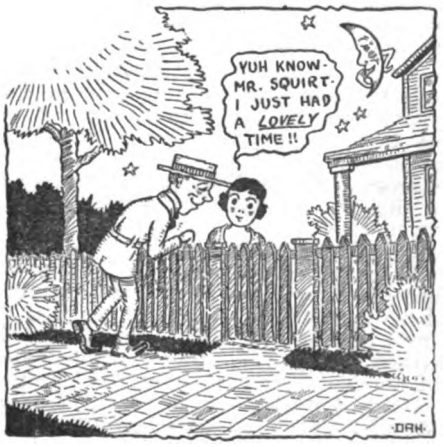
Say fellows, this bird is getting GOOD. In this story he visits T.O.M. and we know you'll get a rib-ache from it. It seems to us it's high time our grouchy old friend had something to say about these things, too. Next month.—Ed.

BY the ever living Ohm Sifter and Most High Dingle Snatcher, also by my most holy Halidom, our September magazine is a humdinger! I'm tickled foolish and have been prancing around the house in such delirious delight that I have just knocked the kid's bank off the shelf. The Fourth of July has gone and went, Doc Cook's shadow has grown less, George Washington is dead, Charlie Ponzi has gone broke, Charlotte Corday has murdered Murat, and last but by no means least, prohibition is prohibiting; still I'm as happy as a new born lark, and that's some joyful. I dance with supreme joy, don't care if my iron wire antenna comes rattling down. "Why", say you, and I'll affirm right here that you've got a darned good right to make the gentle inquiry. So here's where I let you all in on the song and dance. "Whoopee", as our mutual friend, Bill Hart, would say. The September issue of our QST has no "Rotten" article. I guess that Old Beeswax has melted and run. Howl children, all t'gether:

The Wouff Hong has gone
All yell in high pitch,
Yea, he has skeedadled;
The Darned Rettysnitch.
Rah, rah, rah,
Who are we?
We're the boosters
For QST.

My mind is free to act. That was some load to get off it, Eddie. I shall proceed. However, there is something else I want to dispose of, as the old maid said when she tried the chowder out on the family cat. I'm here to tell you of a dream that I had the other night. Now, there are dreams and dreams, and some dreams are great dope. This dream that I had the other night was the outcome of a very large lobster salad, copiously bathed in vinegar and accompanied to my chow hall by a large and delicious dish of chocolate ice cream.

Let us begin at the beginning. All things have beginnings with the possible exception of that howling old mannikin from the west. He just growed, I guess. We are darned well sure he's here, however. Before I had this remarkable dream, I escorted a dream home. I mean one of those dreams who magnanimously allows you to take her to the theatre, then gets you to blow her to a good feed and allows you to lean over the fence and look into her dreamy eyes. Your heart goes out to her in fond regard. You say "Goodnight" and with muffled oar, silently beat it home. Another week's salary gone wrong. What you had spent would have bought a darned good amplifier.



"..... lean over the fence and look into her dreamy eyes."

Well, I had arrived home and had been greeted by Tiny, our Siberian bloodhound. I beat it up stairs and was sitting on the edge of my Ostermoor humming, "I'm But a Stranger Here, Heaven is my Home", when the tranquillity of my bump of amativeness was disturbed by a dark twinge of the stomach. With my usual fortitude and a touch of fiftytude, I ignored this warning of an outraged stomach. I bent my strong will to the task of sleeping, realizing that my boss would raise cain with me on the morrow if I didn't show my usual degree of semigiliousness. After counting all the little sheep into their folds that ever could be wandering, I fell into a fitful doze. I say fell, perhaps it were well that I say precipitated.

My first impression was that I was going

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far away, and with great speed. My mind cleared. I had, in some manner unknown to myself, been transported to the top of the antenna at 1AW. Mr. Maxim was below. He had a large telegraph key in his hand, on the end of which was a gadget that looked like unto a large Turkish fountain pen. He looked up at me and yelled, "You are now about to embark on a rash undertaking, young man. Me and Tuska are going to try to shoot you west in search of THE OLD MAN. We have pooled in and have managed to scrape together enough kale to purchase a large pail of kilowatts and in a few moments you will be on your way." I looked at him and tried to maintain my gravy, I mean gravity. Summoning out my USNRF, or in other words, my reserve, I responded, "Sir Hiram, I go in the pursuit of knowledge, and if I ever find that howling Old Knowledgebox, **It's me and him.** But for the love of mud, what in tarnashun is that thing that you've got there that looks like the east end of a hickey." His chest swelled with the pride of Josephus when reviewing the navy. "That", said he "is my silencer, to be used to aid you in maintaining silence while you are propelled through the ether accompanied by old man Hertz." I confess that momentarily I was ill at ease, but having called out all the Class Four reserves, I resigned myself to fate, realizing that the regular navy was too busy to bother with me. So I yelled at him in unmistakable bravado, "Shoot, old kid, I go to enlighten the heathen." The next thing I knew, I didn't know anything. When I recovered, I realized that the secret of the gas turbine had been discovered, for I was being propelled along at a terrific rate; dash—but I couldn't get my old faithful mouth open to save Robespierre from the gelatine. On and on I sped. I wasn't going at feet per second, kind reader, I was making meters. 186,000 per second and that's some faster than Weston ever could turn 'em out.

Finally I noted with some degree of comfort that I was slackening speed somewhat and that I was volplaning down to a thing that looked like an immense pigeon trap. Upon getting closer I could see that it was composed of chicken coop netting and old odds and ends of hay wire. It was suspended in the air by very rickety looking Czecho Slovaks, or to be explicit, Poles, which howled in anguish with every gust of wind. With a swoop I was seated on this miserable looking contrapshun and tried to compose myself to take a slant below. My speech could not be coaxed to make itself heard.

Beneath this mess, which I now realized served as an antenna, was a little house over the door of which was written, "Enter bugs, you'll find nothing rotten here.—T.O.M." "T.O.M."! Where had I seen these letters before? I mused, yea I meditated. All at once it dawned on me, as the Kaiser said when the sixteen inch shell went down the back of his neck. "The Old Man's dump, by ginger". I sat very quiet because I couldn't do otherwise. Finally smoke began to issue from the back door; no, no, not the chimney. This darned house didn't seem to rate any chimney.

The next thing that I remember a cat let out an awful howl and came flying through the door with the speed of a Haytian revolutionist chasing a Chinaman



"I tried to compose myself to take a slant below."

through the streets of Cape Town. Then the air was disturbed by cussing emanating from the house. I bent to listen and here is what I heard. "Well, darn you, Betsy, I get you moting and every blankety time I press my key you shoot a field coil. Darned if I don't send you back to the junk shop where I got you in New York. Turnsback's got to come coco on this deal. The whole blankety blank works are on the bum" Period. "#$%—&'()

I meditated, "Wonder who in the name of Guglielmo is Betsy" when my equanimity was disturbed by a jolt in the west side of my trousers. Then I heard a shout and another choice collection of cussing. "What the blankety blank's the use, I'm going outside to see what my decrement is." Through the door issued (and "issue" is the proper word, the darn thing didn't walk, I'll be bound) the funniest looking specimen of—shall I say—manhood; that I ever clapped my hypermetropic specs on.

It had short stubby white hair beneath which was a weazened old phizog that looked as though it had beat it from home at the time that Pharaoh was frying Cheops. On the dome was a silk hat,

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much battered, probably a remnant of the Blaine and Logan campaign. From beneath this hat protruded a pair of head phones which looked as tho they might have seen service on The Carlo Alberto. The shambling figure was attired in a form fitting suit probably purchased for the aforementioned campaign from the Tiers Sawbuck catalog. Around the emaciated calves I noted a pair of linemen's climbers. This bird was smoking a corn cob pipe,and I will say that he didn't have any regard for the amount of tobacco that he smoked. Did I say tobacco? I mean the rubber from the tops of storage cells, if I am to judge by smell. This, I guess was the smoke that I had previously observed coming from the door. Well, if that bird came from the rib of a man his father must have thot a lot of children to bring him up.

He paused and I now noted that he had a tape measure in his hand and that his dried up lips were moving. "I got to find out what my decrement is. Milt West says that I'm disturbing the whole doggone rotten neighborhood." With that this old dingbat started to climb one of the rickety masts with the aid of his climbers. He made a half hour every twenty minutes. Finally he reached the top and was shaken back and forth by the breezes. After getting his breath he commenced to yell to his friend wife. The poor abused lady came out of the house and Old Jingle yelled as follows. "Old Woman, I want to get the Naperian Logarithm of decrement of this beautiful antenna of mine. Now I shall hold the end of this tape measure and I want you to take it into the kitchen and let it go up thru the skylight, after which you go onto the roof and jump from there to me and bring the tape with you. After that we will multiply our results in meters by pi and then by heck, I'm sure that we'll have the dope so that we can give Milt a good bawling out." The poor lady hesitated. Gathering up her already shaken nerves the deluded being protested as follows. "Thomas, yesterday you had me break out all the table salt in the house because you said that you couldn't spare the change to buy Sal Ammoniac to charge the battery on the front door bell. Then you had me go in the cellar and turn over five tons of coal looking for some lead sulfide that might have gotten mixed in it by

(Continued on page 22)

Bulb Oscillators for Radio Transmission

By L. A. Hazeltine

Professor of Electrical Engineering, Stevens Institute of Technology

PART II.

Circuit Design

When the various bulb adjustments have been decided on, and when the constants of the load are known for a specific case, we may proceed with the design of oscillator circuits. The numerical calculations in a radio-frequency circuit are simpler than in a low-frequency circuit because the reactances are usually so high in comparison with the resistances that the latter may be neglected in computing impedances, except when the reactances are cancelled by tuning. Thus, with resistance neglected, the impedance of a coil is ωL, that of a condenser is $(1/\omega C)$. That of a coil and condenser is series and tuned to resonance is r. Here the symbols having the meanings indicated in Table I and are expressed either in standard units or in the more convenient radio units.

Let us calculate, for example, the proper circuit constants for a 300-meter radio transmitting set using for oscillators two type T pliotrons (Navy designation CG-1162, Signal Corps designation VT-14), and a 20-ohm (0.20 kilohm) 0.0005-microfarad (0.5-millimicrofarad) antenna, first with the connections of Fig. 9 and secondly with those of Fig. 10. A test of a bulb of this type operated below normal rating to increase the life, gave at a heating current of 1.7 amperes the optimum values of Table II, corresponding approximately to the condition of Fig. 7. The last three items of this table are needed in the radio-frequency calculations and are copied in Table III, together with the antenna data. The lower part of this table gives the calculations for the circuit of Fig. 9, employing the "convenient radio-frequency units" throughout. Similar calculations for the circuit of Fig. 10 are given in Table IV. (In this latter case M_p signifies the mutual inductance between the portion of the coil included in the plate circuit and the portion included in the antenna circuit.)

For simplicity's sake in the above calculations, no account has been taken of the inherent capâcities of the various parts. This can best be done by reducing such capacities to the equivalent values in

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TABLE I. Notation

Symbol	Quantity	Standard Unit	Convenient Radio Unit for low power	Convenient Radio Unit for high power
E	Voltage	Volt	Volt	Kilovolt
I	Current	Ampere	Milliampere	Ampere
P	Power	Watt	Milliwatt	Kilowatt
r	Resistance	Ohm	Kilohm	
C	Capacity	Farad	Millimicrofarad	
L	Self-inductance	Henry	Millihenry	
M	Mutual Inductance	Henry	Millihenry	
ω	Angular Frequency $2\pi \times$ Frequency	Radian per second	Radian per microsecond	

TABLE II. Bulb Test Data

Plate supply voltage	E_b	252 volts
Plate current (direct)	I_b	21.3 milliamperes
Grid bias voltage	E_c	44.5 volts
Grid bias resistance	R_c	15.66 kilohms
Plate alternating voltage	E_p	122 volts
Grid alternating voltage	E_g	84 volts
Useful power output	P	3220 milliwatts

TABLE III. Calculations for Fig. 9.

Bulb Data (2 bulbs)	Antenna Data
$P = 6440$ mw.	$\lambda = 300$ meters
$E_p = 122$ volts	$C = 0.5$ millimicrofarads
$E_g = 84$ volts	$r = 0.02$ kilohms

$\omega = \frac{1885}{\lambda}$	$\omega = \frac{1885}{300} = 6.28$ rad/μsec.
$\omega L = \frac{1}{\omega C}$	$L = \frac{1}{(6.28)^2 \times 0.5} = 0.0507$ mh.
$P = I^2 r$	$I = \sqrt{\frac{6440}{0.02}} = 568$ ma.
$E_p = I\omega M_p$	$M_p = \frac{122}{6.28 \times 568} = 0.0342$ mh.
$E_g = I\omega M_g$	$M_g = \frac{84}{6.28 \times 568} = 0.0235$ mh.

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the main oscillating circuit, by multiplying each by the square of the corresponding ratio of voltages. Such capacities usually amount to a few hundreths of a millimicrofarad and so are appreciable. For example, let us assume in Fig. 9 and Table III the following capacities:

Plate and connections,	0.03	0.05 mμf.
Plate coil,	0.02	
Grid and connections	0.02	0.035 mμf.
Grid coil,	0.015	
Antenna coil,		0.02 mμf.

Then the total effective capacity to be added to the antenna capacity is

$$0.05\times\frac{M_p^2}{L^2}+0.035\times\frac{M_g^2}{L^2}+0.02=0.05 \text{ mμf.};$$

so that instead of 0.5 mμf. we should have used (0.5 + 0.05 = 0.55 mμf.)

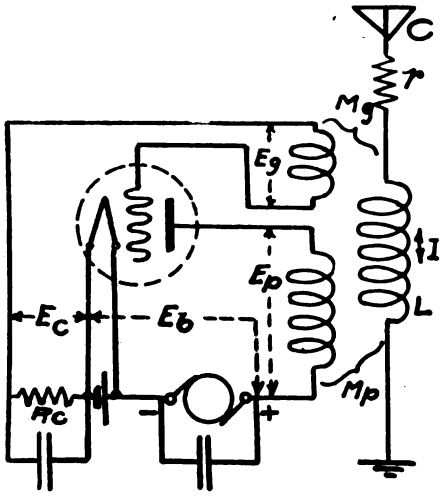
For the coil design we may employ the empirical formula,

$$L=\frac{0.0008\ a^2N^2}{6a+9b+10c}\text{mh.},$$

where **N** is the number of turns and **a**, **b** and **c** expressed in inches are respectively the mean radius, the axial length and the radial depth of the winding section. (In single-layer coils (**c**) is then zero.) The mutual inductances are given in terms of the self-inductance and the coefficient of coupling **k** by the usual formula,

$$M_{12}=k\sqrt{L_1L_2}.$$

The calculation of **k** is beyond the scope of this paper. It will be nearly unity when,

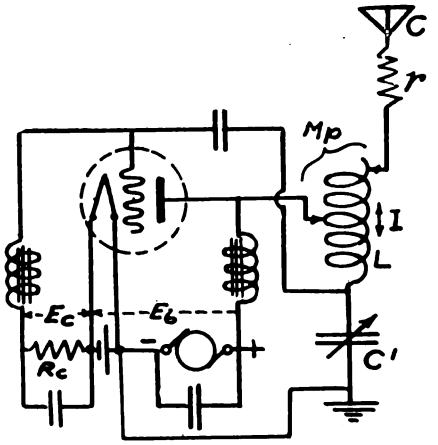


-FIG. 9.-

as with M_p in Fig. 10, the two coils have a large portion in common. For two like single-layer coils placed end-to-end in contact, **k** will be given approximately by the formula,

$$k=\frac{a}{a+3b}.$$

In Fig. 9 care should be taken to couple the plate and grid coils closely to the



-FIG. 10.-

antenna coil and less closely to one another, to prevent a short-wave oscillation in which the antenna does not take part; and where the values of **L** and M_p come out nearly alike (as in the example) it is convenient to connect the plate and the antenna to taps on the same coil, as in Fig. 10.

Symmetrical Oscillators for High Outputs.

As explained previously in connection with Fig. 1 and 2, high efficiency of a bulb oscillator requires that the plate current should flow only during the time while the plate potential is low; and this result can be attained with the usual bulb circuits only by limiting the plate current to a small portion of the cycle. The plate current must have a high maximum value, therefore requiring a high filament temperature, and will be rich in harmonics. The ideal condition would be that of Fig. 1, where the plate potential and plate current are substantially constant for half of each cycle, the plate current being zero for the other half. This condition has been attained by the author with the symmetrical circuit arrangement of Fig. 11a.

In Fig. 11a the plate coil L_p and the grid coil L_g are coupled as usual to produce an oscillation which is transformed to the load essentially as in Fig. 9. Taps from the centers of these coils lead to the filament through the impedance coil **Z** and

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plate generator and through the resistance R_c, respectively. The impedance coil Z is designed to choke out practically all alternating plate current and to pass only a non-pulsating direct current. If the grids of the two bulbs are so highly negative for alternate half cycles as to reduce the corresponding plate currents to zero, then the constant current of the generator will flow to one plate for one half cycle and to the other plate for the next half cycle, giving a rectangular plate current wave as indicated by i_p, Fig. 11b.

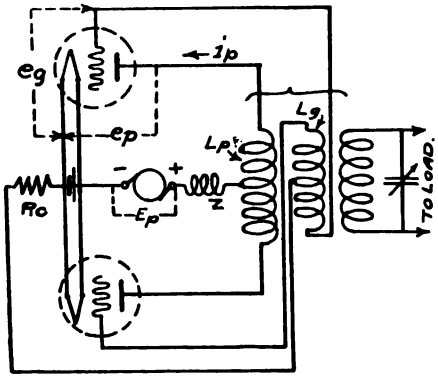
Each grid circuit, including the common resistance R_c, will receive half the alternating voltage of coil L_g, and will permit current to flow during the half cycle in which the grid is positive. The resistance R_c will be so high compared with the internal resistance of the grid circuit in this half cycle that the grid potential will remain very low; moreover, the grid potential will then be nearly constant, as it varies only slowly with the grid current. In the other half cycle, when the grid is negative, no grid current flows and the grid potential will be negative by the half voltage of coil L_g plus the nearly equal voltage drop in R_c. Hence the grid potential will vary as represented by the wave e_g Fig. 11b, consisting approximately of a straight line and a half sinusoid. The voltage across R_c will consist of half sinusoids and will be of double frequency.

The plate potential, during the half cycle of positive grid will be low and near-

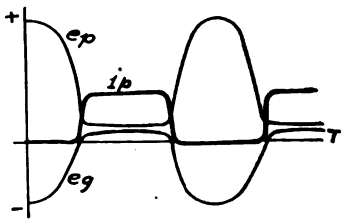
TABLE IV. Calculations for Fig. 10.

Same Data as in Table III

$\omega = \frac{1885}{\lambda}$	$\omega = \frac{1885}{300} = 6.28$ rad/μsec.
$P = I^2 r$	$I = \sqrt{\frac{6440}{0.02}} = 568$ ma.
$E_p = I\omega M_p$	$M_p = \frac{122}{6.28 \times 568} = 0.0342$ mh.
$E_g = \frac{I}{\omega C'}$	$C' = \frac{568}{6.28 \times 84} = 1.076$ mμf.
$\omega L = \frac{1}{\omega C} + \frac{1}{\omega C'}$	$L = \frac{1}{6.28^2}\left(\frac{1}{0.5} + \frac{1}{1.076}\right) = 0.0743$ mh.



-FIG. 11a.-



-FIG. 11b.-

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ly constant, since it has to produce a constant current with the aid of a nearly constant grid potential; during this interval most of the half voltage of coil L_p and most of the generator voltage E_h will appear across the impedance coil Z. In the other half cycle, when the grid is negative and the plate current is zero, the plate will be positive by the half voltage of coil L_p plus the voltage across Z plus the generator voltage. Hence the plate potential will vary as represented by the wave e_p, Fig. 11b, consisting (like the grid potential) approximately of a straight line and a half sinusoid. The voltage across Z will consist of half sinusoids with a displaced axis and will be of double frequency.

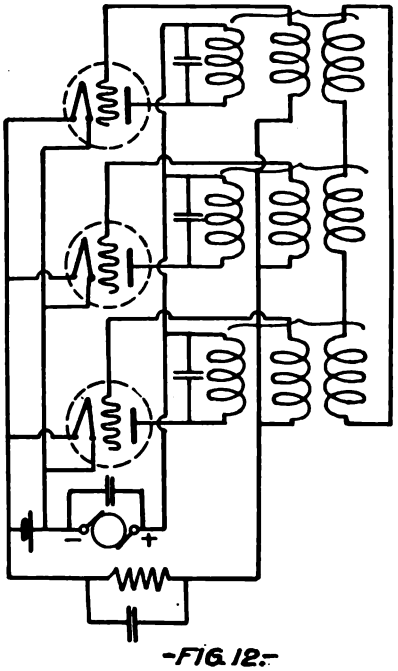
Conditions in Fig. 11 are complicated when the bulb and coil capacities are appreciable, as would occur especially at short waves. Instead of the single coil Z, it might then be desirable to use two coupled coils directly adjacent to the plates, thus eliminating the double-frequency potential of the coil L_p.

The arrangement of Fig. 11 is most useful for high-power bulbs, in which the plate potential during the flow of plate current is a small fraction of the direct supply voltage, and in which the output is limited by plate heating; for here the lowering of the plate loss would be relatively great and would make possible much higher outputs per bulb. It is doubtful whether this arrangement would result in any great improvement when applied to low-power bulbs operating on short waves, as in most amateurs' stations.

Polyphase Oscillators.

It is well known that two or more bulb oscillators having approximately the same frequency will tend to pull into synchronism when coupled. If three coils, one supplied from each of three oscillators, are connected together to constitute a closed circuit, the three oscillators will be coupled and brought into synchronism. The vector sum of the alternating voltages of these three coils must be zero; so in general the voltages will be in polyphase relation.

The above principle has been applied by the author to produce three-phase oscillations with the connections of Fig. 12. The three oscillators are alike throughout and produce equal alternating voltages in the three synchronizing coils at the right of the figure. These voltages then combine to form a three-phase equilateral triangle. It is found that the frequencies of the separate oscillators may differ greatly without preventing their being pulled into synchronism when the circuit through the synchronizing coils is closed; for a correcting current will flow through the local circuit of these coils to satisfy the electrical relations required in each oscillator circuit. The same action takes place in case loads of unlike phase angle are connected across different phases since the plate current and plate potential of each bulb must be in phase.



-FIG. 12.-

It does not seem unlikely that polyphase bulb oscillators may be useful in supplying power to a number of suitably spaced antennas for sharply directive radiation.



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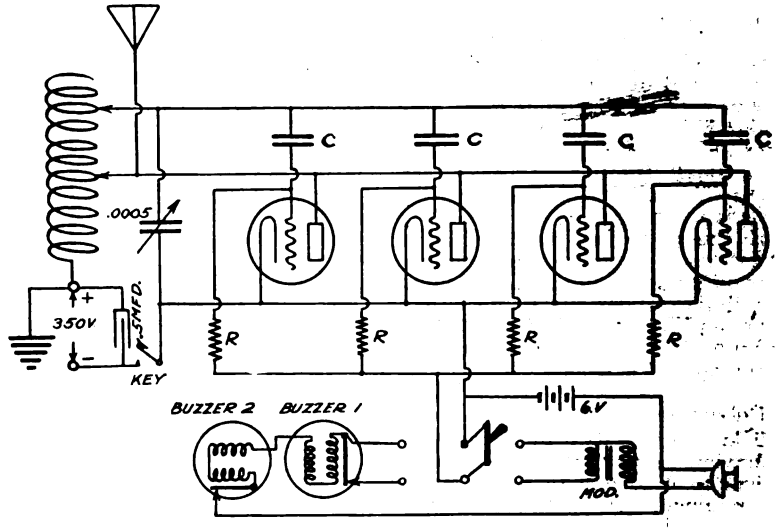
Some More C. W. Ideas

By Arthur J. Funk

Assistant, Dept. of Science, Senior High School, Savannah, Ga.

I have read much in our magazine about continuous wave and modulated C.W., and inasmuch as I have done considerable work with tube transmitters it is but right that the cream of my efforts should be given my fellow workers.

Of over twenty-five circuits thoroughly tried, I have at last concluded to use the electrostatic circuit in preference to all others; first of all, because of its high efficiency, and secondly, on account of its simplicity. The circuit I am now using at 4XB is shown in the attached diagram. The switching arrangement is such that



one DPDT switch closes the circuit for either phone or buzzer.

I believe that under no circumstances should tubes be used without grid condensers, because the space current will travel to the grid and thru the grid coil instead of going direct to the filament, since the resistance of the grid winding is much less than the space resistance from grid to filament. This would cause the grid to become hot and bombard the filament by secondary emission, dangering the life of the tube, as evidenced in oxide-coated-filament tubes so used when the filaments begin to sputter.

When more than one tube is used, individual grid condensers and leaks should be employed so that each tube will get the proper grid discharge and leakage—which is impossible with a common grid condenser because the tube with the least grid-to-filament resistance is apt to get the entire discharge, which means that the other tubes will continue to draw current without oscillating, causing them to heat. The installation of individual condensers and leaks in our station increased our radiation over 100% and stopped all tube heating. The condensers, C, for VT-2's at least, should be not less than .0005 mfd. and not more than .0008 mfd., preferably of mica. The grid leaks, R, are made of glass tubing, about 2 mm. inside diameter, 4 in. long, packed with lampblack, with brass plugs at each end. The best value for VT-2's is between 8000 and 10,000 ohms, depending on the filament current.

The best buzzer modulation is obtained by breaking the grid leak circuit with the contacts of a buzzer whose fields are in series with another buzzer, the second buzzer controlling the frequency, as shown in the diagram. When using the contacts of but one buzzer to open the leak circuit, it is seen that the chopping is poor since, while the contacts are open, the circuit is still closed thru the key and battery side.

For telephony we use a large transformer of about 15 watts input, in the leak circuit as shown, and in order to handle the primary input at least three microphone buttons are used in parallel, on a potential of 6 volts.

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Radiophone-Telephone Linking

OUR readers have read of the many successful experiments in linking a radio phone set and the ordinary wire telephone whereby speech may be transmitted over both systems, but we know of no work done in that line by amateurs. Now that radio phones are becoming popular, there are some interesting possibilities in this work. When listening to a radiophone concert, haven't you wished that you could call some friend on the wire phone and let him hear it too? And, going a step further, if two of you have radiophones, wouldn't it be interesting to have a system whereby each of you could link up the land phone to your sets so that any one with a telephone in their house could be reached direct by you, the other operator, or any part in his town?

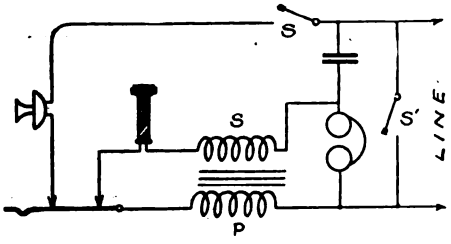


FIG 1

With a little care this can be done without the slightest trouble to the telephone company.

Such systems of course require an operator at each radio station to tune in the signals and to throw the change-over switch at each conversation, as breaking-in as done on the ordinary phone is of course not possible by ordinary radio. The idea, then, is to take the incoming speech from the line, use it for modulating the radio output, and, at the receiving station, to impress the received speech on the line, with an operator listening in all the time at each station.

The circuit of the usual central-station-energy telephone is shown in Fig. 1, and in the writer's experiments the best method of coupling to the line was found to be thru the secondary of the telephone transformer, as shown in Fig. 2. When a phone line is idle, the circuit is open to d.c. (altho ringing is accomplished by a.c. thru the large paper condenser). Removing the receiver closes the circuit and attracts the attention of Central, so that if any experiments are to be made which might result in closing the circuit, it would be well to insert a switch in the circuit as shown at S, to temporarily open the circuit. Likewise, when connection is once established, breaking the circuit is the signal to Central to disconnect the line, and if any changes in circuit are to be made while a connection is held, it would be well to arrange another switch to short the line, as S'. Leads, then, are taken from the secondary of the transformer and run to the radio set, and the headset, of at least 2000-ohms, connected across them.

In the writer's experiments it was desirable to make no changes in the radio set and it was consequently necessary to perform the modulation thru the usual microphone circuit of the radio set. This made it necessary to step up the incoming speech thru a one-stage amplifier (see Fig. 2), the output of which was connected to a step-down transformer whose secondary was of fairly low resistance. This secondary was connected in place of the microphone in the radio set. For receiving, the same amplifier was used to amplify the radio-received speech, which was then impressed on the line thru the telephone transformer secondary as previously mentioned. The diagram is self-explanatory, and shows a 4PDT switch for the change-over.

Considerable success has been had with mechanical "couples" formed from a Baldwin mica-diaphragm receiver and carbon-granule microphone, by removing the microphone diaphragm and adjusting the two pieces of apparatus (either by taping together or mounting in an improvised stand) so that the receiver diaphragm rests with proper pressure on the movable electrode of the microphone, thus forming a

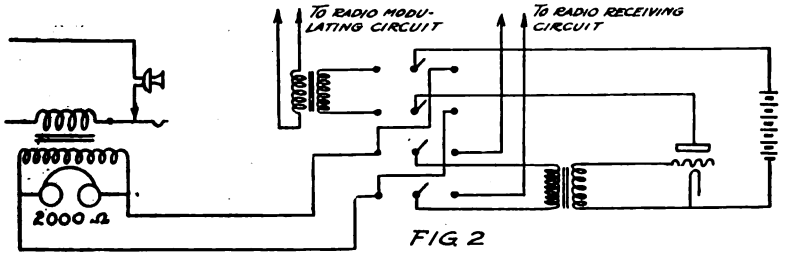


FIG 2

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very sensitive mechanical amplifier. Substitution of such a "couple" in place of the step-down transformer in the circuit of Fig. 2 will give much more vigorous modulation, and it can also be used as a mechanical amplifier in receiving, but has the objection that often it is impossible to find an adjustment satisfactory for both the transmitted and received speech, since generally they are of different orders, and like all such devices its adjustment is critical.

This work was done with sets employing the Heising d.c. method of modulation. Grid-leak modulation is much more common in amateur sets, however, and it is suggested that if the fluctuating potential set up across the terminals of the telephone transformer secondary were conveyed directly to the grid-leak circuit, the amplifier and transformer might be eliminated With tube repeaters and other apparatus, the Navy and some of the commercial radio companies have been able to perform this linking with utter nicety, and the arrangements described herein are at best but crude experiments, but they show the possibilities for the amateur, with even limited equipment.

THE YOUNG SQUIRT'S SECOND EPISTLE TO THE OLD MAN

(from page 15)

mistake. But I draw the line on this Wright Brothers stuff. You can write Milt West and tell him that I draw the line on the acrobatics. I'm gonna finish baking them pumpkin pies, after which I'm gonna play Beethoven's Sonata on the old melodeon".

Upon hearing this, Old Parchment Face let out a tremendous roar. He shouted, "Woman, when you married me in 1801 didn't you promise to love, honor and obey?" The lady snapped out of it with a start and muttering, "You're my lord and master", by heck, she took the end of the tape measure and proceeded to carry out the wishes of this ancient lump of clay. Then did he grin. I distinctly heard him say, "When I speak, the whole rotten lot of 'em stand around."

Whereupon the lady started to wail and moan while Old Hatchet Face, sitting on his perch, chuckled with hellish glee. Grasping the end of the tape line she shambled into the house, only pausing to trip over the aforementioned bruised and battered cat who had temporarily taken up its abode in the doorway. She stooped and carried Tabby within.

Finally she emerged from the doorway and placed a ladder against the wall of the house and got to the roof. With much effort she moted to the skylight, opened it and by the great horn spoon, who should emerge but the cat with tape securely knotted to her tail. Then Old Drybones commenced to coax the cat to jump to him. "Pretty kitty", said he, "Come to dadda". Fine language for the lord and master. After much coaxing Tabby jumped and the bird on the mast caught her. He took note of the reading on the tape and slid to the ground accompanied by his cat and many moans and groans.

Upon reaching terra cotta he made a kick at the poor animal—removed a slip stick from his pocket and tried to delude the world at large into believing that he knew how to use it. He muttered at great length about Alpha and Omega—finally got to Pi and Lambda—took off the Blaine and Logan cheapeau and threw it on the ground, stamped on it and otherwise worked himself up into a rage. He was fussing and fuming around when a yell came from the roof. The Mrs. Old Lady had slipped and was falling to the ground at express rate speed. Old Whiskers looked up and said; "Hold on, I can't afford a funeral this year"! Whereupon the party of the second part replied in a woeful tone, "I die in the name of science and now you won't get any pumpkin pies". Jingle howled in anguish, and hurried as fast as he could to the spot where his faithful tho antique spouse lay on the ground. She looked into his dim eyes and gently murmered; "I go to a better world, Thomas, but before I go will you please see if the pies are done and tell me what you decrement is?" And he answered, "Aw, you go to Hoboken!" Could a worse curse be put on anyone?

During these tragic moments I was vainly trying to get down from my perch but could not seem to break the spell which held me.

Finally the Old Man took a slant aloft and let out a demoniacal yell. "By the living gods, what kind of a rotten looking animal is this I see astride my mast? I'll tear you limb from tree." He deserted the spouse of his buzum, and went into the house, all the time launching invectives that his serenity should have been disturbed by a "Rotten Young Squirt from the East." He came out in a few minutes with a shot gun, took a good careful aim at me and pulled the trigger. "Boom!" went the gun, and I was awakened from my fitful doze. I was in a cold sweat and was pulling Dempsey stuff on my pillow. I caught myself yelling, "you darn Old Uggermuff, I'll beat the living daylight out of you, providing you've got any in you."

So I arose from the Ostermoor that I had purchased on the installment plan, went below to the kitchen and broke out the raisins. I'll fix 'em up in a little luke warm water and in a coupla weeks I'll be prepared to fly Old Electricity alive.

I'm all excited now!

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Addendum to Mr. Groves' August Article

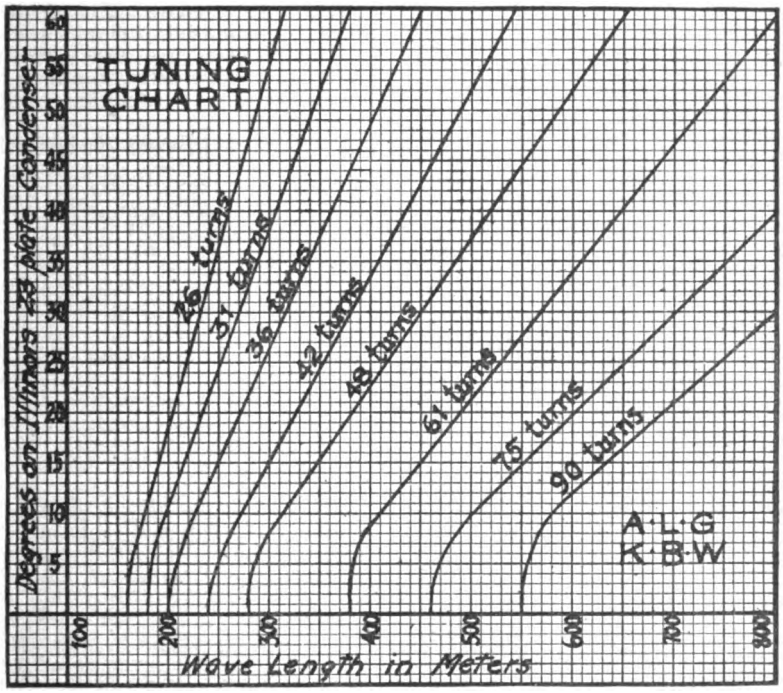
SINCE writing the article in August QST, I have conducted some careful experiments with the hand wound coils for short waves as described therein and the accompanying chart shows the wave length range of a number of them over 60 degrees of the Illinois 23 plate condenser. I have adopted the 23 plate condenser exclusively now for the secondary circuit as it gives better tuning on the short waves and at the same time allows tuning to 17,000 meters with ease when using the Honeycomb coils

to at least 400 meters.

Coil 61 operates nicely on all waves between 400 and 500 meters, and for extreme selectivity may be used as high as 600 or even 800 meters.

Coil 75 may also be used on any wave between about 460 meters and 800 meters. Its maximum range is about 1700 meters with condenser at 180°.

Coil 90 is designed especially for 600 meter work and is extremely efficient on waves between 550 and 650 meters—the tune where all the so-called 600 meter



The numbers at the top of each curve show the number of turns of wire on the cylinders.

Each cylinder is exactly 5¾ inches diameter, of XX Bakelite.

As can be seen, the 36 turn coil is used for practically all amateurs for maximum strength signals, as its minimum wave is almost exactly 200 meters, and it is very efficient for all waves between 200 and 230 meters—where most amateurs are tuned. For greater selectivity on these waves and a somewhat lesser strength of signals, Coils 26 or 31 are used.

Coil 42 has a minimum wave of about 240 meters and will operate efficiently up to at least 300 meters.

Coil 48 is designed especially for 300 meter signals and it will operate efficiently

stations may be located. It also operates nicely on 800 meters—the radio compass wave. It has a maximum wave length of about 1900 meters with the condenser at 180 degrees.

In actual practice a coil of 18 turns is used in the plate for 200-300 meters and the 36 turn coil for 600-800 meters. Coils 26 and 31 are used in the plate for waves between 300 and 600 meters.

With a large 115-plate variable in the primary only one coil is necessary for all waves between 200 and 800 meters. This coil is composed of 12 turns.

I hope this will clear up some of the tuning mysteries of short waves for a lot of your readers who may be just breaking into this interesting game.

—A. L. Groves.

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Stolen Autos

HAVE any of you fellows ever thought of the possibilities of amateur radio in helping recover stolen automobiles? The matter was brought up here at headquarters recently and we took it up with the Chief of Police of Hartford. He is taking it up with the City Police Commissioners and we hope soon to have a regular schedule for broadcasting police alarms covering stolen automobiles. In practice the scheme is to have certain definite hours during the day if possible, and anyway, during the night, when everybody will be at his station on the lookout for police or other important alarms. Of course everybody cannot be on but there will always be some who will. The Police Departments in all the different towns and cities of a certain zone will know these hours and if they want any alarms broadcasted all they have to do is to telephone a few minutes before the hour set. Whether it is in Hartford, or Springfield, or New Haven, or Bridgeport or New London would make no difference. The alarm would be spread everywhere. Brief details of the number, make, style, and color of the stolen machine will be given and not only will every Police Department in the entire zone be apprised of the facts, but in addition several hundred radio amateurs would also have the data and unconsciously will be on the lookout. It would certainly seem that it would be more difficult for the thief to make a safe getaway than it is now. At the present time when an automobile is stolen and the local Police Department notified, each town and city has to be telephoned to separately. This takes time and costs money and all towns and cities are not notified. We amateurs are located in all sorts of places and all of us would be reached instantly and at no cost whatsoever.

Our idea of the best way to put the scheme into practice all over the country is for the local radio clubs to take it up with their local Police Departments and other radio clubs and work in zones. It would be a fine thing for all concerned except the thief. It would be the first time that amateur radio stations would be put to a real practical use all over the country. Here is something for every club officer to bring up at the next meeting of his radio club. The scheme is a good one fellows, and let's do something with it.

The Midwest Convention

THE Midwest Division just couldn't stand it, and we don't blame them. So they are going to have a convention of their own, and we are glad. St. Louis is the place, and the time is the 28th, 29th, and 30th of December, the last of the Christmas Holidays, when the fellows will be home from school and when everybody will have some spare time. The energetic Bill and Benny are in charge, of course, and that means assured success and a whale of a good time for everybody who attends. We're going to try to get out ourselves, although it is a mighty long way from the Quist Factory.

The two young gentlemen mentioned are sawing off a job for themselves in trying to outdo the Chicago Convention, yet they swear they will make that Classic look like a meeting of the Knitting Club, and darned if things don't look like they would. St. Louis is a great place for a convention, and it is the first meeting of that kind in that territory. It will be a splendid opportunity for the amateurs of the valley states to get together and chew the fat, and to them we say "Go! It's the best thing you could possibly do—there's nothing on earth like meeting the gang face to face and talking things over." Good luck, fellows!

Distance Records

SAY, who has the amateur long distance record, anyway? Blessed if we know here at GHQ. It is claimed that prewar 2PM, New York, was copied in Los Angeles at about the declaration of war. Old 2AGJ at Albany, we understand, was copied by a ship off lower California; 9ZN was reported by a ship 200 miles south of Balboa, 8DA was heard by a vessel off Venezuela, 6EA got through to Honolulu, an operator on a ship 3000 miles below

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Frisco has reported a whole flock of stations, and now it looks like NSF has been heard in Bristol, England. But just what constitutes the supreme amateur DX record for approximately 200 meters?

All of us want to find out, so you fellows are invited to send in your claims to QST and we will co-ordinate the dope. Tell us the date, the input in watts, the wave length, the location of the recorder, and the distance claimed, and submit anything that may help to prove it. We'll publish an article on the subject when the material comes in. Let's do it right, so we'll actually know, and then in months to come we can keep record of the new marks that are made and know who is the title holder. Remember this is not a miles-per-watt record, but a pure distance classic—the most miles on an amateur wave length.

Au Revoir—Et Soyez Le Bienvenu!

THE month of September brought many changes in radio matters, none of which was more unexpected than the resignation from the Department of Commerce's staff of Mr. H. C. Gawler, Radio Inspector for the First District.

Starting in 1911 with headquarters at Long Wharf, Mr. Gawler became the first government radio inspector of us here in New England in the old days of disorder and any wave length and power. Later we found him on the seventh floor of the Custom House at Boston, with spacious quarters and a splendid view of the harbor. There amateurs and prospective operators displayed their skill to his satisfaction and in most cases received the coveted license. During the border uprisings in Mexico he served as a Captain in the Signal Corps, where he acquired an uncanny fondness for mules. As Communication Officer for the U. S. Navy he served as Lieutenant at the Azores during the late war. He now enters the amateur sales department of the Radio Corporation of America, with offices in New York, where he launches into the new field of amateur C.W. development. At a convention of amateurs in Portland in September, Mr. Gawler announced that the R.C.A. was preparing to soon put on the market a complete line of high-grade bulbs, including power tubes from five to two hundred and fifty watts, at prices within the reach of the average amateur. It is to superintend the sales of this equipment that he has entered upon his new duties.

Few radio inspectors have been more beloved by the amateurs than Mr. Gawler. He is a prince. His many friends regret to see him leave the First District, but are glad to see him better himself, and he has our heartiest good wishes.

Succeeding Mr. Gawler is Mr. Charles C. Kolster, formerly of the Ninth District, and brother of Mr. Fred Kolster, the decremeter wizard. A better successor we feel we could not have—it is our gain and the Ninth District's loss. Mr. Kolster's radio experience dates back to 1905, and he has seen much of radio in his work with the old Stone Tel. & Tel. Co., the DeForest Company, the United Fruit, the Bureau of Posts in the Philippines, the Naval Re-



Capt. H. C. Gawler, U. S. A.

serve, and with the Department of Commerce. Except while in uniform during the war, he has been a Radio Inspector since 1914, serving at Washington, New York, New Orleans, and Chicago, and now returns to his old home city, Boston. QST regrets that no photograph of Mr. Kolster was available in the short time we had, but our readers are referred to the illustrations in the story of the Chicago Convention in our last issue, where Mr. Kolster is seen as Chairman of the Trial Board of the Chicago Executive Council. This is a fair indication of the co-operation he has extended the amateurs of the country during all of his service—his administrations have been wonderfully successful. He is assured of the strongest support from the A.R.R.L. and we welcome him to the First District.

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Our New Traffic Manager

ON August 27th Mr. J. O. Smith resigned as our Traffic Manager, and Mr. F. H. Schnell, A.R.R.L. City Manager of Chicago, has been elected as his successor.

The duties of the position of Traffic Manager in our rapidly expanding organization have grown to such proportions that for some time past it has been impossible for them to be done justice in the spare time of a busy business man, regardless of his unlimited enthusiasm for the work. This, and the many new things we as a League are undertaking, and the unlimited possibilities of our future growth, made it seem very desirable that, in electing a successor to Mr. Smith, a change be made in our League policy and someone be secured who could devote his entire time and energies to the work. Such a man, of course, would have to earn his living from our work, so that it was necessary for us to make the position a paid one. Two years ago all the work of our League was done by an enthusiastic few in their spare hours, and we really doubted that we would ever be able to afford a paid secretary. But that venture has proved successful, and our affairs have now expanded to the point where we feel that engaging the services of a man who can make A.R.R.L. relay progress his daily concern is the best possible step we could take. There are many things before us, and the correspondence of our Headquarters office is so intricately bound up with our Operating Department work that it has become imperative for our future growth that the Traffic Manager be located right here in Hartford along with the Secretary, working hand in hand. We feel that this marks a most important step forward in our affairs and will be of far-reaching benefit.

Mr. Smith is one of the best-known amateurs in the east, as he was long before he became our first Traffic Manager. During the years that he was in charge of our Operating Department it has been brought up by his efforts into the big, strong, effective, international amateur radio relay organization which it is today. Mr. Smith is entitled to feel highly gratified over the success of his hard labors—our Operating Department is what it is through the conscientious and intelligent work that he has done in perfecting the organization. For this his name will ever stand in A.R.R.L. history, and he has the gratitude of every A.R.R.L. man.

In Mr. Schnell we have a man extremely well qualified to fill his place, a man who has been phenomenally successful as an A.R.R.L. organizer, and whose achievements in A.R.R.L. work are already well known. As Chicago City Manager and Chairman of the Chicago Executive Council, he has been personally responsible for the successful co-operation which has made Chicago an example in amateur affairs for the entire country. We know that he has the co-operation now of all our membership, and we regard his acquisition as a big gain toward a stronger and better A.R.R.L.

Mr. Anthony

WE welcome to our Board of Direction Mr. Harvey Mitchell Anthony, head of the Department of Applied Electrical Engineering of the Muncie (Indiana) Technical High School. Mr. Anthony is well known in amateur circles in his territory and we feel is a strong addition to our governing body. His professional work is consulting electrical engineering but his great interest in educational work holds him to his present school work, and in addition to this and his amateur activity he is a member of a number of scientific societies here and abroad. He brings to us vision, experience, and technical attainment, and we offer him the right hand of fellowship.

Straight C. W.

WHEN QST undertook the boosting of Amateur C.W. a good many months ago, we said that it was probable that, at first at least, we would have to use chopped or modulated transmission, because most amateurs assiduously avoid permitting their receiving bulbs to oscillate, and the transition would take time. We feel now that the time is ripe to make the plea for straight undamped, which is what we have had in mind all along. When we get that we have something! The straight C.W. is amazingly effective, even to one who has become accustomed to I.C.W. tube transmission. It is good for easily three times the distance that the same energy, modulated, will work over to a non-oscillating detector, with the superlative advantage that spark QRM is greatly reduced. In addition, as a great engineer has said, the best known minimizer of QRN is the oscillating audion. It takes less apparatus, and the efficiency is improved in another particular that one no longer worries about the percentage of modulation.

Every such problem has its bad points, and the receiving is the "nigger" in this case. It is hard to heterodyne such high frequencies as we use, yet it may be done if we have precision of adjustment. There are two improvements which must be made in our receivers: vernier tuning adjustments, and a shielded cabinet to avoid capacity effects from the operator's hands

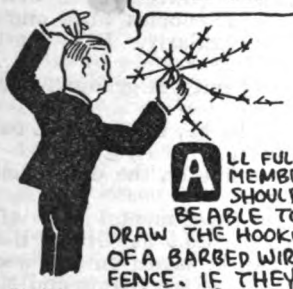
(Concluded on page 59)

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WHAT TO DO AT YOUR RADIO CLUB

FURTHER MISINFORMATION

BY D.A. HOFFMAN



ALL FULL MEMBERS SHOULD BE ABLE TO DRAW THE HOOKUP OF A BARBED WIRE FENCE. IF THEY CANT— ANYTHING SIMPLE LIKE A SHORT WAVE REGENERATIVE TWO STEP AMPLIFIER HOOK-UP WILL DO.

MAKE A MOTION THAT TWO-THIRDS OF THE CLUB'S FUNDS BE SET ASIDE FOR REFRESHMENTS ON THE GROUNDS THAT IT WILL INCREASE ATTENDANCE



YOUR RADIO CLUB DANCE SHOULD HAVE RADIOPHONE MUSIC. IF THE RADIO PART OF IT DOESN'T WORK OUT O.K. YOU CAN RUN A WIRE TO THE CELLAR AND USE A MICROPHONE AND PHONOGRAPH INSTEAD. THE LADIES WILL NEVER KNOW THE DIFFERENCE ANYHOW.



MAKE A SPEECH LASTING AT LEAST TWO HOURS ON "WHICH SIDE OF THE METER YOU SHOULD GROUND YOUR SET."





THE ORIGINAL WOOFF HONG

INVITE YOUR LOCAL "OLD MAN" (EVERY RADIO CLUB SHOULD HAVE ONE) TO ADDRESS A SPECIAL MEETING OF THE SPARK COIL QRM'ERS OF YOUR VICINITY. HAVE HIM BRING ALONG HIS WOOFF HONG FOR A DEMONSTRATION. THE MEETING SHOULD BE A LIVELY ONE !!

CODE PRACTICE SHOULD ALWAYS BE HAD. THOSE WHO ARE ALREADY HIGH SPEED OPERATORS ABLE TO RECEIVE TEN WORDS PER MINUTE MAY MONKEY WITH THE TESLA COIL ON THE SAME TABLE AS THE BUZZER. THIS WILL FURNISH REALISTIC INTERFERENCE.

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THE OPERATING DEPARTMENT

F. H. SCHNELL
61 Waverly Bldg., Hartford, Conn.
TRAFFIC MANAGER.



GREETINGS, fellow amateurs and members of the American Radio Relay League.

I have been appointed Traffic Manager of this great body of radio amateurs with the view in mind of increasing operating efficiency and increasing membership. This can be accomplished most reliably by the earnest co-operation of each and every member of the League.

. To that end I heartily solicit your suggestions concerning anything that you think will be an improvement in the Operating Department, and will welcome frank constructive criticism.

It is my intention to give your suggestions and complaints every consideration necessary to satisfy the majority.

Each division desires representation, no doubt. Bearing that in mind, members of the Operating Department personnel must realize that it is absolutely essential that reports from the Division Managers be in this office not later than the first of each month.

At this time the good winter season is upon us and we must make the best of atmospheric conditions that prevail. Let us strive for the greatest year in the history of the American Radio Relay League by co-operating with each other.

Reports for the Divisions follow:

NEW ENGLAND DIVISION
G. R. Entwistle, Manager

The warm weather has hung on in New England later than ever this year, retarding amateur activity in general.

On October second, 1386 amateur licenses of all grades had been issued in the First District. The latest call was 1HBK.

The papers say Edison is trying to perfect very sensitive apparatus to communicate with departed spirits. Perhaps it will be useful in QSOing Worcester and Springfield from the rest of New England.

A. D. M. Donald Mix reports Brown University's C.W. set as coming QSA out his way. Boston-New York traffic is moving O.K. 1BBL is doing commendable work. The volume of traffic handled throughout this section is steadily increasing. 1QN of New Haven has a C.W. set in operation. 1TS copies 8DA and 8ZV C-W sets quite regularly. Both are using but a single VT-2.

Boston and vicinity is gradually becoming C-W-ized.

Robinson, A. D. M., reports 2ZL coming QSA in Braintree.

1DBU sounds fine on the undamped set. He is in Boston.

1XD is the experimental lab. of the Western Electric Co., at Green Harbor, Mass. They can be heard on 395 working the KQ boats of the Merchants and Miners Line, several of which are equipped with wireless telephone sets. This work is being done in co-operation with the Independent Wireless Telegraph Co.

1DH is shining up his 1000 volt D. C. generator in anticipation of the arrival of a couple of limejuice tubes. Whittier reports the addition of a couple of half K.W. spark transmitters in his neighborhood, to help matters along.

When 1OAT and 1RYE get together with 1HOP someone will have 1BUN. (His address please).

Bates and McLean were in Boston for the big Odd Fellows parade Sept. 29th. Both have the C-W bug.

1AE will probably return to Boston from New Bedford where he has been "learning the business". 1FB has returned from Maine.

ATLANTIC DIVISION
C. H. Stewart, Manager

Relay work in this Division has not been as active as it should be for the month of September. Owing to changes in the traffic officers there has not been as close supervision of traffic conditions as is necessary in order to properly co-ordinate the efforts of the various sections comprising the Division.

Reports have not been received this month for the territory of New York and New Jersey, as this is a very important part of the Atlantic Division viewed from the radio standpoint. An effort will be made to see that this does not occur in the future.

Mr. Chas. A. Service, Jr., has found it

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necessary to resign as Division Manager. Mr. Charles H. Stewart (3ZS) St. David's, Pennsylvania, has been appointed, and desires to state that suggestions looking toward the improvement of relay conditions and the League work in general will be most gratefully received by him, as it is only by receiving criticisms that improvement may be brought about.

In order to fill the vacancy existing in the office of District Superintendent for Eastern Pennsylvania, Mr. Samuel W. Place (3BH), 622 Stanbridge Street, Norristown, Pa., has been appointed Superintendent for this District. It is his intention to extend the activities of this territory, in which a large number of amateur stations are located by the appointment of several Traffic Assistants as well as a City Manager for Philadelphia. The idea is to have more assistance in carrying out the detail work of the organization. Furthermore it is believed that a live Traffic Assistant with a restricted territory in his charge would be in much closer touch with the various stations in his section than is possible where the District Superintendent has to cover the whole territory himself or with the aid of only one Traffic Assistant.

It is hoped that it will be found practical to extend this idea to all Districts of this Division. It is the strong conviction of the Division Manager that a division of the work in the manner outlined above could be carried out in all the Divisions with much advantage to the League work.

With regard to the Trunk Lines in this District—A, B and D, the information we have at hand does not show that satisfactory through work is done on any of these Trunk Lines. Lines A and B (Northern and Central routes east and west) can by no means be considered as complete, for, in order to get traffic through, it is at present only accomplished by relays that are too long to be reliable under all conditions. In order to change this state of affairs it is necessary to communicate with by letter and interest in the work of the League a larger number of station owners, and the suggestion that more Traffic Assistants be appointed is in line with this thought. Considerable traffic has been handled between Ohio and Western Pennsylvania and the seaboard over lines A and B, but only in most instances by long jumps.

On Trunk Line D, reliable communication can be carried on between New York and Wilmington, Del. It is believed that traffic can be freely handled between these points and for Philadelphia and the large adjoining suburban district. The real problem on this Trunk Line, which still exists, is to do satisfactory relay work between Philadelphia, Baltimore and Washington. Mr. Service (3ZA) has recently been in communication with Linthicum (3KM) at Washington, and McNaughton (3HJ) at Haverford, Pa. There are a number of other stations in and near Philadelphia that are being heard at a distance, 3EH-3DS-3EV, etc., and with their help and that of the recently re-opened station at Princeton University (3DH) there is no reason why the interchange of messages between New York and Philadelphia can be considered otherwise than reliable.

On Trunk Line B to the West there is much room for additional stations, as satisfactory short relays have not yet been found to take care of message work via this Line, and results can only be accomplished by long jumps from New York and Philadelphia to Pittsburg and stations on Pennsylvania Branch Line No. 2 (Washington, Pa., to Erie, Pa.) such as 8WY-8DV-8RQ, etc.

The monthly report of Mr. R. C. Devinney, Superintendent Western Pennsylvania, states that relay work in his District is taking a decided turn for the better, and advises that 8WY and 8DV will be working Sept. 25th, and also that 8RQ is back. There is a new station at Washington, Pa. (8ACF) which he says bids fair to take the place of old 8JQ.

In addition 8MT at Uniontown, Pa., is again in operating condition. Williams, 8ZD, traffic Assistant of this District, is again on the job, with his recently acquired wife as an assistant operator. Considerable QRM is being experienced in Pittsburgh from spark coils, which Devinney says are operated from 6 a. m. to 3 a. m., and which hamper distance work. Devinney states that from present indications Branch Line No. 2 will be the best branch line in the country.

Mr. Herbert M. Walleze (8BQ) has been appointed District Superintendent for that District. Mr. Walleze states that so far as his District is concerned conditions are far from satisfactory to him, but that he is doing the best he knows how. These conditions are due to no lack of enthusiasm on his part, but can be attributed to the scarcity of radio stations in the central portion of Pennsylvania. He advises that 3ABD at Danville, Pa., has his station nearly completed.

Mr. E. B. Duvall (3EM), Superintendent Eastern Maryland District, advises that his address has been changed to 3909 Cottage Avenue, Baltimore, Md., and that he soon expects to have a transmitter in operation there. He reports that there has been a general increase in activities in his District and that Yearley (3AN) has erected a higher and stronger antenna to replace the one blown down. Nothing has been heard by him of Cooke (3GZ) or Dichmann (3HG). Primrose (3AA), Fal-

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coner, Hart and Geiglein are so busy with a playlet, which they are getting up as a benefit for the Radio Section of the Maryland Academy of Sciences, that they won't do any operating until it is over. Mr. Duvall states that information has been received by him that there will be an efficient station shortly in operation at Frederick, Md. (20 miles northeast of Baltimore) owned by Mr. L. I. Kennedy, 219 East 2nd Street.

Call letters of this station as yet unknown. Conditions between Baltimore and Washington have not changed since an attempt was made to get something across during the Summer static. Tests were made by Mr. Kruse at the Bureau of Standards (WWV) and Duvall. It was learned by Duvall that signals from WWV were heard at 2PL during these tests. Duvall again emphasizes the fact that he would certainly like to learn of some good stations north of Baltimore and between that city and Wilmington. Baltimore will boast of having a Ham (F) this coming winter, but Duvall says he is a little skeptical as to the use of the word "ham", as he is informed that she is equipped with a First Grade Commercial License. He won't give out her name or call letters yet, but says if anyone mentions the name he'll whistle. It is hoped that the amateurs of Baltimore will give their hearty support to Mr. Duvall this winter, and help him place Baltimore on the active radio map. Come on Baltimore fellows, and let us see that you are able to overcome the natural difficulties of your position.

Several changes in call letter assignments have been noted recently by the Division Manager of stations in this Division, as follows: Ehrhardt—8CE changed to 8ZQ; Williams—8EN changed to 8ZD; Seuffert—3AX changed to 3ZG; Snow, Washington, D. C., pre-war call 3JR changed to 3ZE.

ROANOKE DIVISION
W. T. Gravely, Manager

With the approaching winter months close at hand, there is decided activity being manifested by the amateurs throughout this Division. Stations are being overhauled, new plans are being projected, and new stations under way. The prediction is, the greatest season ever known to amateur circles.

Reports are slow coming in this month from the various District Superintendents, and I want to remind the Superintendents that, if we are to maintain a well regulated, active Division, monthly reports must be made consistently and regularly. The Division Manager is dependent upon the District Superintendents for the happenings in their respective Districts, without which, report cannot be made to Headquarters. I will, therefore, request that the personnel please bear this in mind, in future.

Effort is being made, at this time to open up the main trunk line to the South, but whether this can be accomplished without a circuitous route depends upon the stations in Central Virginia and North Carolina. However, if it is found necessary, 3BZ will take a certain amount of traffic intended for Southern points, from all other points North, and clear through 5DA, who will in turn clear through 4AG, 4YA, or some others. We realize that this isn't the proper way to route the Southern traffic, but unless the North Carolina and South Carolina situation clears up, we can see no other way. It is our desire to get away from long jumps wherever, and whenever possible. We still have our hopes of a daylight line, and with persistent effort, it is an assured fact.

The situation to the North of Danville is not as good as might be expected, but Mr. Blair, 3HO, District Manager, Richmond, assured me that Richmond will be a relay point this winter, and if such turns out to be the case, will prove a valuable adjunct to the main line. Traffic should easily be handled from Washington, Richmond, Danville, Greensboro, Charlotte to points South. North-bound traffic should easily follow the same route. However, it is desirable that Lynchburg, Roanoke, Williamsburg and points in between Washington and Richmond, and between Richmond and Danville, be linked in. Also, Winston and Salisbury in North Carolina. To work the routes out properly the stations interested must pay attention to test work, and co-operate to the utmost. Definite lines will not be created until this test work has been carried out, as it is very necessary to know how each station can handle traffic from another station.

Mr. Wohlford of Roanoke, 3CA, District Superintendent, states that he is making a desperate effort to get the South West Virginia section in shape, and is working on Bluefield.

Mr. Clarke, Assistant Division Traffic Manager, Danville, is now busily engaged in installing his station, and will soon be in shape to handle traffic to the North or to the South. He will be very glad to arrange tests throughout the Division, and to assist individuals who will write him. Address communications to A. S. Clarke, Pine Street, Danville, Va.

Late advices from Mr. F. L. Bunker, District Superintendent, North Carolina, Charlotte, are to the effect that there will be three stations located in Charlotte, two of which will operate with C.W. sets. Mr. Laxton, 4DD, will assist Mr. Bunker in handling traffic going through Charlotte.

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All North Carolina stations which expect to participate in relay operations will please confer with the District Superintendent immediately.

EAST GULF DIVISION
E. H. Merritt, Manager

The new Division Manager is having a hard time getting started. He has written quite a number of radio men throughout the Division, but only a few letters have been received in reply. Unless we have a little more co-operation, it is going to be hard to secure good results from this division, so I ask all men concerned to please get in touch with me as soon as possible. The winter season with its DX work is fast approaching, and we want to be ready to do good work as soon as 'static' lets up on us. Already we have been able to do a little work from Atlanta this fall and indications are that we can work now, nearly every night.

There are two of the original trunk lines passing through this Division—one coming down the Atlantic Coast from the north to southern Florida and another from Jacksonville westward to San Francisco. We want to begin in this Division by opening these routes for traffic and also, a route coming down from Ohio, Kentucky, Tennessee to Atlanta and then on down to Florida, and a route from Virginia, North and South Carolina to Athens and Atlanta and then west to New Orleans. The route west from Jacksonville has been placed in the hands of Mr. C. D. Short, 233 Washington Avenue, Macon, Ga., (4DA) who is the Assistant Division Manager. All men in line for this work in Florida, South Georgia, and Alabama are requested to please write him immediately as we know of very few stations on this route and there are a number of very long jumps that must be filled in.

The route through South Carolina is being held up on account of no stations there being known. There must be at least one or two stations in South Carolina capable of doing work with stations in the adjoining states but we have been unable to discover any of them yet. Any men having radio sets in the state and especially those capable of transmitting to out-of-state stations are earnestly requested to write to the Division Manager and tell what you can do. It is now necessary to relay to 5DA from 3BZ or to attempt the jump from 3BZ to 4AG to get traffic through and these routes are not satisfactory. A short jump route should be arranged that will be much more satisfactory to all.

We hope to have routes open before long as follows: Coast Route, 3BZ, 4CE (Charlotte, N. C.), 4AG, 4BK and 4DA (Macon, Ga.) to Savannah or 4AN (Boston, Ga.), Jacksonville, 4AT, to Miami, to Key West. Inland Route, 5DA (Wind Rock, Tenn.), Chattanooga, 4BQ (Rome, Ga.), 4YA and 4XC (formerly 4BZ), to Macon, etc.

Our old friend and stand-by, 4AG, will be with us again with a few improvements that should make his spark easier to copy.

There will be two good stations in Macon, Ga., this fall, 4BK and 4DA. 4BK was heard occasionally last spring, but the early summer season of "static" closed him down before he made himself known to many of us. 4DA, the Assistant Division Manager is a new man and is unknown to most amateurs. He has had quite a bit of experience in both Navy and Commercial Radio, and we are counting on him having one of the best relay stations in the Division.

In regard to the situation south of Macon, we have very little information. This part of the Division seems unusually slow in getting into operation and we have not been able to hear from them about the relay work. They are probably being held up by the severe "static" we have had during the summer.

5DA, of Wind Rock, Tenn., has his set going again and is QSA, as usual, in Atlanta. We are trying to work up the route from Wind Rock to Atlanta and we will probably depend upon 4BQ and some new station going up in Chattanooga.

4YA expects to put in a 2 k.w. transmitting set this fall and will also have an up-to-date regenerative receiving set. Georgia Tech in conjunction with the Atlanta Radio Club, has published articles in the newspapers of the state about the work we hope to do this fall and have requested that all men owning sets write us at once. They are making a register of the radio stations of the state with a view to putting on a definite program of communication with all these stations according to plans that are now being worked up.

The Division Manager requests that all men in South Carolina, Georgia, Florida and Alabama get in touch with him at once, so that short jump relay routes may be worked out and be put into operation.

DELTA DIVISION
J. M. Clayton, Manager

At last the summer QRN season in the South has come to a close. The weather has cleared up and traffic is going through in fine shape.

The stations South are working under a handicap that none of the Northern stations seem to have to contend with. In connection with the QSS tests for this division the Division Manager wants to especially thank 5YH, 5ZP and 5YE for their faithful attempts to get something through.

Louisiana is getting lined up in great

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shape. Before the season has been going far, relay work through the larger cities of Louisiana will be a nightly accomplishment.

Barrow of 5EA was laid up with a stroke of lightning which knocked his station completely out.

Buehler, of 5HA, has a new 1KW set that promises to reach all over the country.

De Ben, being a senior at Tulane has found it necessary to find an assistant to keep 5ZP open each night.

Mr. Greenlaw still lacks juice at Franklinton but will be "on hand" with something.

As to 5YH, he will be in with both feet and a couple of hands. He is out of the Little Rock "QRM Zone" and will be counted on to handle a larger portion of the traffic coming through this.

The Division Manager's station is now open for business.

MIDWEST DIVISION
L. A. Benson, Manager

The writer wishes to thank all the District Superintendents for getting their reports in on time this month.

9DU, Independence, Mo., is fixing up for the big start. Routes have already been arranged with all of the District Superintendents. Although the route from Independence to St. Louis has not been completed it has been perfected to such an extent that relay work over it may be carried on continuously. Stover, 9JA, and Turner, 9DU, have been discussing means whereby the District Superintendents of the division may co-operate this coming winter instead of going at relay work in a haphazard manner and let each District Superintendent and his Assistant be responsible for the delivery of any messages that have their destination in their respective territories. It seems in this way we can keep messages from growing stale on the hook.

9EL, H. L. Owens, has been ill the past few weeks he reports. 9AEG and 9AEQ have proven dependable relay stations the past few weeks. 9RY, O. A. Kimball of Topeka has been appointed Assistant District Superintendent, Eastern Kansas. Mr. Kimball reports that stations in Topeka are beginning to wake up. 9NO will be on for relay work in the near future. 9RY has been experimenting with a quarter inch spark coil. Mr. Owens desires to have it known that weather reports are sent out daily by 9YV of Manhattan Kansas 9:55 A. M.

9LR, P. E. Thurman, Anthony, Kansas, has been appointed District. Superintendent Western Kansas, and all stations in that territory kindly get into communication with Mr. Thurman at once for positions on relay routes through western Kansas.

9JA, P. A. Stover, has changed his location and any communication to him in the future should be addressed to 213 East Market, Iowa City, Ia.

9HT, Omaha, Nebr., reports things picking up in his territory in the way of traffic handling. A dependable station has been located at Freemont. Mr. Palmquist and Mr. Johnson of Oakland are both operating stations and are ready to handle traffic. Mr. Smith of Tilden, is forging ahead and is destined to become an important factor in the handling of traffic on Route No. 3. A meeting between the amateurs of Omaha and the Power Co. officials was held this week in the office of the City Electrician and it was decided that every amateur in Omaha will have to undergo a cost of over one hundred dollars for separate pole transformers if they desire to continue operation of their sets.

9IF, Giltner, Nebr., will make an effort to induce several schools in the western part of the state to install good apparatus for relay work.

9LC, Mr. W. E. Woods, the City Manager, reports that he has the city of St. Louis lined up in excellent shape for the coming season. He takes great pride in pointing out the fact that St. Louis has more dependable DX stations than any other city in the country. There will, at all times throughout the season, be at least two good DX men on the job, thus assuring stations in the neighboring states that their traffic can always be cleared through this city.

DAKOTA DIVISION
R. H. Pray, Manager

Relaying has taken a new lease of life and routes and Trunk Lines are shaping up as never before. The outline suggested for the Trunk Line A last month, namely BQ, to 9ZC, to 9ZX, to 7IM seems to be the one route that is handling traffic and will continue to act as Trunk A while relaying is gaining speed. Trunk Line B is commencing to gain some semblance of form as 9EE at Ellendale, N. Dak , and 9AIG at Sioux Falls, S. Dak., are both doing commendable DX work.

From all reports the Central Division Convention was a huge success and fully worth the effort put forth by the Chicago Executive Council. Although it is not feasible to hold such a convention in this Division at present we hope to be able to put on a meeting of some sort within the next year. An invitation is extended to all amateurs, especially in Manitoba and Dakota Division, to attend the Annual Convention of the North Dakota Radio Association to be held at Grand Forks, November 26th and 27th, the Friday and Saturday

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after Thanksgiving. Further information will be found elsewhere in this issue. Can anyone tell us why there is so much of this QSX stuff drifting around in the Central Division? It seems that invariably the Central Division Stations reply QSX. (Whasitmeen Eddy?)

Superior, Wisconsin has been placed in the Dakota Division and will be in the Northern Minnesota District as formerly. Mr. W. C. Bridges of Superior, has been appointed Assistant Superintendent in the Northern Minnesota District under Mr. J. A. Gjelhaug. Mr. Bridges was appointed Assistant in the Wisconsin District when Superior was a part of the District in the Central Division and will now act in the same capacity in both Divisions. All amateurs near Duluth and Superior should get in touch with Mr. Bridges, addressed to Naval Radio, Duluth. Mr. Gjelhaug, 9ZC has been remodeling his station and his spark is heard over a wide range.

Mr. Harold Larson, Superintendent of the South Dakota District, reports a number of new stations in his District but mostly limited to the southeastern corner of the state. Station owners in all parts of South Dakota should hasten to get in touch with Mr. Larson.

Mr. Boyd Phelps, 3344 South First Street, Minneapolis, Superintendent of the Southern Minnesota District, has been doing some very commendable work along the line of talks to Twin City Radio clubs. He says that all they needed to start things booming was an explanation as to the workings and aims of the ARRL. For, startling as it may seem, many did not have any idea of the principles or ideals for which the League stands. Mr. Phelps said "Maybe I can't beat N. Dak., in summer relay routes but I bet I can set the pace in affilliations and keep the other districts in my dust" and dared me to tell it. So here it is. And from all indications that district will set the pace in memberships as well as from the number of application blanks which have been sent there, they must be eating them. It looks as though the Twin Cities would soon be in a fair way to equal Chicago as an ARRL city.

Stations outside of the cities are beginning to appear. 9HM of St. Paul is fast coming to the front and reports having worked stations as far east as New York State. Although Mr. Otterholm, 9HM, has only this fall come into prominence he is an experienced operator and will no doubt take an important part in the Dakota Division Operating personnel this winter.

This announces the opening of Trunk Line A to the Pacific Coast handled BQ, to 9ZC, to 9ZX, or 9HM to 9ZX to 7IM, Billings, Montana. 7IM has gotten messages through to 7CU the same evening they were received from 9ZX and works 7CC also so that traffic should be handled regularly over this route.

WEST GULF DIVISION
F. M. Corlett, Manager

At last the Summer static is beginning to show signs of easing up and giving us a chance to hear the distant stations again. We know that long distance relay work, during the Summer months in this section of the country, is impossible over any great distances. We had this fact impressed upon us more than ever last Summer. Next Summer we are going to work right along over the Trunk Lines, and to this end we are going to begin laying our plans now. We are going to develop the SHORT RELAY PLAN to its fullest extent. Now let's all get down to actual business of moving the traffic in a systematic way. Say the first station was working with the next station in line on a trunk line under favorable conditions and the second, third, and possibly fourth station on this line could copy the first station, PROVIDED some fellow close by did not open up with something from a Ford coil to a one K.W. For the sake of argument let us suppose that the second, third and fourth stations were clear and listening to the first station send five messages to the second. Being close together and QRM being reduced No. 2 gets all five O. K., and calls No. 3. No. 3 HAPPENED to get them all O. K. EXCEPT the address to one of them, so when No. 2 calls and asks him QRV?, No. 3 answers giving him an O. K. on what he copied from No. 1, and asking for the missing address. No. 3 clears No. 1 in a few minutes' time and calls No. 4. No. 4 only got three of the five O. K. when No. 1 sent them and would probably be still asking No. 1 for the other two if they were working direct, instead he QSL's the three he has received O. K. and No. 3 G.A's with the other two getting an O. K. on them the first time. Now this work was all done on reduced power; all FIVE messages have been received at No. 4 ACCURATELY in far less time than if No. 1 had sent each word twice or three times and then repeated a couple of times. The short jump system is by far the best plan if we are to move any volume of traffic.

TRUNK LINE RELAYING is going to be the real traffic moving plan. With that in view this Division is going to develop an efficient TRUNK LINE SYSTEM. The Trunk Line Stations are going to be selected by the actual work they can do. In order to determine the stations best suited for Trunk Line work nightly tests are to be conducted over each Trunk Line in each direction. There are two Lines crossing this Division, Line "F" Grand Forks, N. D. to Houston, Texas, and Line

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"C", Jacksonville, Fla., to Los Angeles, Calif. This Division is directly interested in Line "F" from the Northern boundary of Oklahoma to Houston, Texas, and Line "C" from the Eastern boundary of Texas to the Western boundary of New Mexico. The stations selected as Trunk Line stations nearest these boundarys will be considered Division Terminal Stations on their respective Trunk Lines. The Traffic Rules of the A.R.R.L. say that relay work shall be conducted from 9 P. M. to 12 midnight. 9 o'clock is the starting time for all relay work. The Division Terminal Stations will start a test message to the next station in line as soon after 9 o'clock as possible, the message to be forwarded to the next station and so on until it reaches the Division Terminal Station on the opposite side of the Division or until some station can not forward it further, in which case that station will forward it BY MAIL to the Division Manager. In no case will a test message be held over from one night to another, but forwarded from the last station that received it. The last station receiving it should not fail to forward it immediately as that gives his station credit for being on the job.

In order to easily distinguish the test messages and that their distinguishing marks shall have a definite meaning and serve as an address, test messages on Line "F" will be known as "FOX" and on Line "C" they will be known as "CAST". A "FOX" will be a test running NORTH or SOUTH and a "CAST" will be a test running EAST or WEST.

This test system will be adopted October 1, 1920. Test messages will be considered as filed at the Division Terminal Stations at 9 P. M. regardless of what time the Terminal station forwards it to the next station.

Radio conditions throughout the division look more encouraging than they have for some time. Oklahoma continues to come to the front and with more "observing" some good relay stations are going to be selected before long. As a starter the station of Arnote & Poor, 5EF, McAlester, Okla., has been selected as a Trunk Line station. Mr. M. C. Poor is manager and operator and W. J. Arnote part owner. We need more stations in Oklahoma on Line "F" North and South of McAlester. Mr. Lowrin Dill, 5HL, Oklahoma City, has a good station under construction.

Mr. Falconi announces two appointments. Mr. R. W. Goddard of Las Cruces, N. M., has been appointed Assistant District Superintendent of the Las Cruces Territory. Mr. C. E. Noll, El Paso, Texas, has been appointed Assistant District Superintendent of the El Paso Territory which includes the counties of EL PASO, HUDSPETH, CULBERSON JEFF DAVIS, PRESIDO, REEVES, LOVING, WINKLER and WARD. Mr. Falconi says the prospects for the Southern Route, Line "C" look good. With Harrison old 6GQ of Phoenix in California and Trump, old 9BT in Phoenix the Pacific Division should be able to unload a few of these "baskets" of West bound traffic.

The Amarillo Territory is progressing rapidly under the direction of A. D. S. Martin, many of the enthusiasts are becoming members of the League and a live club in Amarillo proper has begun to take form in a satisfactory manner. The Pilot Point Territory under A. D. S. Mosteller is coming forward. 5IS, John W. Cain and E. C. Simpson of Denton deserve mention. 5CG at McKinney has purchased the sending equipment of 5ZG at Dallas and now has it installed at McKinney. 5AL, Cecil Butcher of the Greenville Territory unfortunately has a position that requires his time during the early part of the evening but states he will be on hand after midnight.

Max Pierce, 5IA, ADS of Corsicana Territory is installing a C.W. set.

Mr. Fate Sherrill has moved his station from Kernes, Texas, to Corsicana, call, 5IB. Roy Miller, 5FE of Corsicana has recently installed a quarter K.W.

District Superintendent Tilley reports relay communication has started in earnest it seems for the air is full of amateur sparks nightly not waiting for the complete disappearance of our old enemy QRN.

Have had fine reports from all districts except San Antonio that they were all ready. Nearly all the Austin operators are back from the sea where they learned a lot about the efficient handling of messages.

College Station, 5YA will be on as soon as school opens.

5ZR of San Antonio has promised us some help in the way of a splendid station there but so far N. D.

New Braunfels is well represented by 5HH at the New Braunfels High School with Mr. E. A. Sahm in charge of the operation.

Things in the Houston Territory are in fine shape for DX work.

5ZW is now in better shape, having finally gotten up on 375 after considerable difficulty in getting the proper size O.T. 5ZW will be working his C.W..

5EO has improved his antenna system 100 per cent. and with a few more changes which he is now making, will be a class A station.

5GH is still building his station.

Goose Creek Oil Field has a splendid receiving station, and a similar set is being installed at Cedar Bayou, by the same operator, Mr. Hartis. He hears practically all Fifth District Amateurs on one bulb.

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Beaumont, Texas, is silent.

5AE, although never having transmitted, has been reported from Chicago and numerous eastern stations, and as the result, has made the threat that he intends to let himself be heard just as soon as his set is completed.

PACIFIC DIVISION
E. G. Arnold, Assistant Manager

At last it seems that the west coast is coming back to its own again. Each night the conditions seems to grow better. Very good work is being done considering the amount of QRN and the number of new beginners in this section around the Bay Cities. Traffic is coming from the north via 7CU, 7CW, 7BP along with others.

A very promising station is being set up in Colusa, Calif., station 6TC which will help a great deal to bring the traffic from the north down with less difficulty. This station will lighten the work that has fallen to 6EJ and 6AK of Walnut Grove. A great deal of credit is due these two amateurs as they have been handling a great deal of traffic.

6BQ is back again. He is installing a short wave regenerative set and two step amplifier, which will further increase the good work that he has been doing. Work to Reno has been rather uncertain but through the efforts of 6BQ and 6QR reliable service will soon be insured. 6QR is a very promising station in Reno.

6ZA of Salt Lake reports that he will be ready again.

A number of Bay City amateurs have been doing very good work, working direct with 6EJ, 7CU, 6JM, 6JD, 6JI and a number of others. Most of the relay work is being handled through 6BN the station of H. Shaw and H. Holliway. Shaw is operating the set.

A. E. Bessey, 6BR of Sunnyvale, has installed a new panel type transmitter designed for 150, 200 and 375 meters. This will greatly relieve the QRM situation. This is what we long needed in this section, and we now have it under able management.

Traffic to the South is being handled by a number of stations in and around Los Angeles, and San Diego. A great deal of trouble was experienced there due to QRM from the arc at NPL. A number of the stations doing good work in the south are 6JM, 6JD, 6JI, 6EN, 6ER, 6KP, 6SK and 6CO. 6AT will be with us stronger than ever with his new apparatus.

Traffic to the East has been almost an impossibility, no practical work being accomplished via southern route. Better luck has been found to the north. 6EJ reports getting messages from the east through 7CU of Vancouver, Wash., and further states that 7CU is now ready to take east bound messages.

A number of the amateurs have recognized the merits and taken sides with High Power Receiving in the cases of High Power Transmission versus High Power Reception and have arranged their sets accordingly with a resultant increase in efficiency.

NORTHWESTERN DIVISION
J. D. Hertz, Manager

The month of September has been marked by important changes in relay conditions in this division. Lessening of atmospherics was apparent early in the month, and traffic is now handled with comparative ease, "sixes" being worked with regularity from Oregon points, and frequently from Idaho and Puget Sound districts. Ninth district stations are now being worked from stations in eastern Montana.

The most important and far reaching event of the month is the reopening of a transcontinental relay route on trunk "A" through Idaho and Montana. This happened on the night of September fifteenth when 7IM, L. J. Sims, Billings, Montana, connected with 7CU, Mumford Brothers, Vancouver, Wash., thereby completing the route from the coast to 9ZX, who is QSO east. The route has been open almost nightly via 7IM and 7CU at Moscow, Idaho. With the appearance of 7HS, at Glasgow, Montana, and the prospect of having JN, A. C. Campbell, (ex-7ZC) at Jordan, Montana, the route east over trunk "A" will be materially strengthened. O. M. Heacock, 7ZH, of Enterprise, formerly 7ZH of La Grande, Oregon, is with us again. Having completed his new station, he will be on nightly, using two wave lengths, 200 and 375 meters. He also will be a great help in maintaining trunk "A", especially since he has no trouble working 7YS at Lacey, Wash.

At Moscow, Idaho, 7CC, Jack Woodworth, District Superintendent for Northern Idaho and Eastern Washington is back after a summer without a transmitter. He reports:—"The prospects for the northern transcontinental trunk line 'A' have infinitely brightened this fall. A station, 7IM, at Billings, Montana, has been QSA here for some time, and recently has been connected with. He appears to work 9ZX with comparative ease."

C. N. Teed, District Superintendent for Southern Idaho, at Kuna, reports:—"Things are beginning to liven up to some extent. Amateurs are overhauling their stations in preparation for the fall opening.

"7YA has installed new and higher masts which will probably give an increased range. As 7YA will have three stages of amplification available this winter it should make a valuable relay station."

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Royal Mumford, Assistant Division Manager, to whom all credit is due for A.R.R.L. organization in this division during the past summer, reporting for Portland, Oregon, and Vancouver, Wash., says:—"LD radio communication has assumed regular winter proportions with the coming of favorable weather. More and more stations are taking the advantage of these static-less nights.

"We have noticed the difficulty with which we copy Seattle and Tacoma stations which is a characteristic of winter weather. We often hear 'sixes' working them when we cannot hear the Seattle boys ourselves.

"The route east on trunk line 'A' has been definitely opened. From here ready communication is maintained with both 7CC at Moscow, Idaho, and 7IM at Billings, Montana. 7IM maintains communication with 9ZX at Valley City, N. D. A permanent schedule is being worked out for this route.

"Work with 'sixes' as far south as they exist is carried on with remarkable ease. Regular A.R.R.L. traffic is handled direct with Los Angeles just about as easy as with Walnut Grove, Ukiah, or San Francisco.

"Local stations who have been handling traffic the past month include 7DS, 7ZI, 7DP, 7BP, and occasionally 7BR. 7DS has been on quite regular, as has 7DP. 7ZI has a spark that gets through, and also has been trying some low power CW experiments, having worked 6OH using a VT2, but is bothered by poor receiving conditions at his station. 7DA has also gotten through south. 7FH in Vancouver is on more or less regularly, and gets through both north to Seattle, and south into the sixth district. 7CU works one or more of the several Los Angeles stations almost nightly. 6JD, 6JM, and 6JI of Los Angeles are the ones most easily worked there, especially 6JD. They all three use high pitched sparks which are very QSA here in the late evening. Unlike many sparks of its kind, 6JD seems to carry fine, and is easily readable through QRM.

"7FV at Everett, Wash., is easily worked from here and we expect to handle regular traffic with him from now on."

Olfan DeGuire, 7CW, District Superintendent at Silverton, Oregon, reports:—"Most of the traffic handled south from here the past month went via 6EJ. Other sixth district stations have been worked, but lacked traffic to give them.

"Have worked 6QR, 6AV, 6BJ, and 6FS. I do not experience any great difficulty moving LD traffic as I did before, so lay it to a change in conditions."

In Seattle, 7BK and 7AD continue active, working through to the sixth district, though experiencing more difficulty in working Portland stations. Howard F. Mason, 7BK, District Superintendent reports:—"Gradually there seem to be more and more stations on the 'active' list, although there are few of them who can handle relay traffic.

"It seems as though etheric conditions are reverting back to the way they were last winter:—That much difficulty was experienced in working Portland stations, while 'sixes' further south are worked with comparative ease.

"6BJ continues to tear things up around here, some times it is hardly possible to work locally through him. Other sixes are heard here regularly and come in fine, especially 6BN, 6BQ, 6AK and 6EJ.

"7CC has been heard here for the first time in several months."

7FV, also of Everett, promises to be a good connecting link with British Columbia.

Our old friend 6EJ of Walnut Grove, Calif., reports the following interesting information on the audibility of seventh district stations, as received at his station:—"The QSA ones first: (7CU) (7CW) (7AD) 7ZI, 7BK, 7BP, 7CE, 7CC. The last three same QSA."

ONTARIO DIVISION
A. H. K. Russell, Manager

September seems to have been a particularly barren month for news and for wireless work. Owing to the fact that reports have not been received from the several district managers this month this communication must of necessity be short, and can only speak of Toronto and vicinity.

The establishment of C.W. stations is going on fast, and from inquiries of wireless manufacturers in the city it appears that many of the Toronto amateurs are going in for transformers and rectifying bulbs, instead of the more expensive generators. One generator set, that of Mr. E. Rogers, (3BP) is already in operation. The Marconi Company has installed one of their ½ K.W. 500 cycle sets in the wireless school in Toronto. The manager also hopes to have his generator set working in a short time, as soon as the delivery of the generator is made.

The manager heard from Mr. Carter of Windsor, who advises that the C.W. germ has bitten deep into the radio life of Detroit, Windsor and vicinity. It is expected that two large transmitting sets are to be installed in Chatham, and the District Manager, Mr. Carter, is very anxious to get into the C.W. game as soon as he can.

From Brantford comes the information that wireless in general is experiencing a great uplift, and it is confidently expected that communication may be established between there and Toronto before many months have passed. Brantford is still sticking to spark sets, but if energetic work

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and interest count for anything, they should be heard from soon.

All in all, prospects look very bright for a successful year in the Ontario Division.

CENTRAL DIVISION
R. H. G. Mathews, Manager

The Central Division Convention being over, Chicago is again settling down to preparations for the long distance season. A number of changes have been made in the personnel in this Division during the past summer.

Extensive preparations for handling traffic will be made by all the Superintendents and it is expected that everything will move with even greater speed and less friction than during the past season. Attempts are being made as far as possible to create **short distance routes in order to insure message relay work,** but in some sections of the Division such routes are practically impossible due to the scarcity of stations.

Mr. Wendell Holst, former president of the Ravenswood Radio Association has been appointed Chicago City Manager; Mr. Adams, 9AT, Mr. Marco, 9CD, and Mr. Stolte, 9NJ, Assistants. Mr. Holst is taking up Mr. Schnell's work and hopes to carry on the Chicago organization as effectively as it has been carried on in the past.

Mr. Melvin Herman, 1419 South 9th Street, Sheboygan, Wisconsin, has been appointed Assistant District Superintendent for the state of Wisconsin, relieving Mr. C. F. Bates of Milwaukee.

Mr. Cecil Bridges, formerly of 9ZL, found that a good long distance station was needed in Superior, Wisconsin, and accordingly, being in the Navy, he requested transfer to the Naval Radio Station at that place and now has an amateur station going, temporarily signing BQ until his license is issued. By this action Bridges has opened up the entire Northwest to the Lake Shore Route and we are now able to handle messages for this territory with the greatest ease from Chicago where connections can easily be made with southern, eastern or western routes. We are especially proud of Mr. Bridges and wish to take advantage of this opportunity to thank him both personally and on behalf of the Division for the sacrifices which he has made for the efficiency of our relay system.

Mr. W. S. Taylor of 9GA, being a hard working Western Union man with inconvenient hours, has resigned as District Superintendent of Illinois. He has done excellent work while holding this position. The Division Manager will be pleased to receive letters from operators who believe they are so situated as to handle the job of District Superintendent of Illinois, such communications being addressed care of Radio Station 9ZN, 5525 Sheridan Road, Chicago, Illinois.

9ZN has started its regular winter schedule and is now in operation from 10:00 P. M. on, every night when weather conditions permit. In addition to Messrs. Mathews, Hassel, Buck and FitzSimons, 9ZN now has as operators Mr. F. J. Marco of 9CD, who signs FJ, and Mr. C. H. Zeller of 9AU, who signs ZO. With these six men on the job the Central Division distributing station should be in a position to handle traffic with great efficiency and we will therefore welcome your heaviest traffic.

CW sets are coming into wider use throughout the Division, 8DA using such a set entirely for relay work, using the spark set only for calling. Many other stations are also making such installations, notable among these being 9BY of Rock Island, Illinois, and 9FF of Urbana, Illinois. In addition to the 2 k.w. 60 cycle non-synchronous and 500 cycle Telefunken panel quenched sets 9ZN now has in operation a De Forest radiophone and CW transmitter putting out 1¼ amperes on a wave length of 375 meters. It is intended to use this set as far as possible for medium long distance work in order to avoid creating interference locally and the Division Manager will therefore appreciate co-operation of the various relay stations in trying to carry on work with this set wherever possible.

The October Bureau of Standards fading tests are being carried on at the time of this writing and we feel honored in that two of our stations have been chosen as transmitters on these tests, and in addition to this the Division was assigned 80 recorders which is in excess of the number assigned any other section of the country. The response to the letters of the Division Manager requesting participation in these tests has been very gratifying and we wish to express our thanks to all of those who have so willingly come forward to help.

The report in the next issue of QST will contain convenient operating schedules to be followed in this Division and the attention of all relay stations is called thereto.

BUREAU OF STANDARDS—A.R.R.L. TESTS OF SHORT WAVE RADIO SIGNAL FADING

(Concluded from page 12)

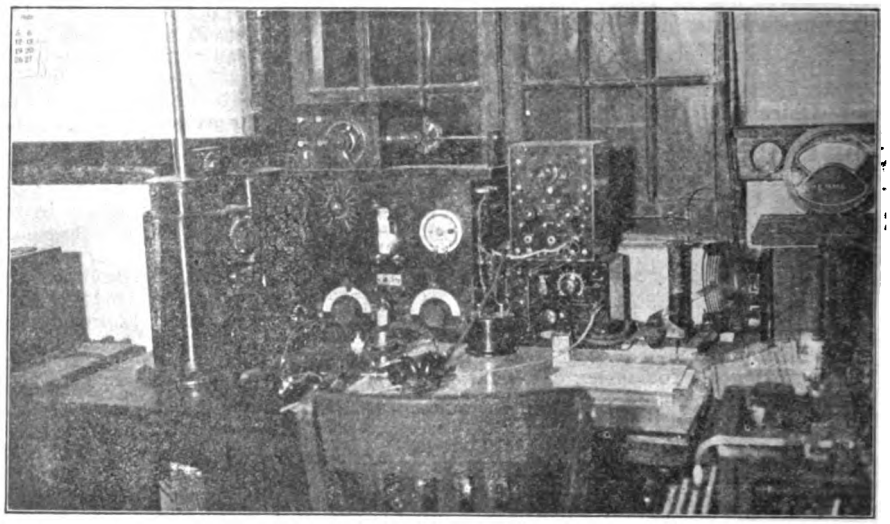
swings are exaggerated, turns in the curve appear too late, and small variations are omitted. Mr. L. C. Young of NSF suggested the method which proved best in practice, that of using dots for each letter and drawing in the curve later. In this way, attention is paid to each letter, and the tendency for the pencil to acquire a "drift" is checked.

(Part II, to be presented in the December QST, will describe the results of these tests, illustrated with curves of various classes of fading.)

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5GJ, WACO, TEXAS



5GJ is the station of Mr. Henry M. Harris, A.R.R.L. Asst. District Superintendent, at Waco.

The transmitter is contained within the oak cabinet at the right and comprises a ½ K.W. Packard transformer, 3 sections of Murdock condenser, and a Murdock O.T. The leads are short and heavy, and the antenna current 3 amperes. 5GJ did not tell us what kind of gap he uses, but we imagine he employs one of some sort.

The aerial is 6 wires, 80 feet long, on 30-foot masts on a two-story building, giving a total height of 65 feet.

The receiving set speaks for itself—long waves as well as short. Since this picture was made a short wave regenerative receiver has been added.

5GJ's signals have been reported by the S.S. "Hugoton" while 1500 miles south of San Francisco—good work.

6WN, SAN DIEGO

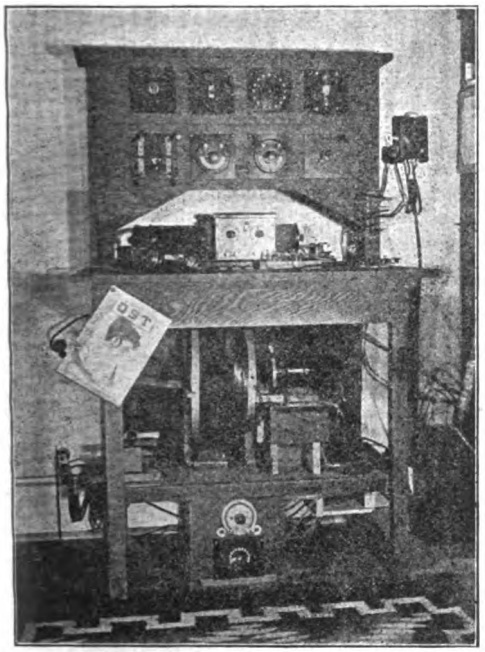
This is the station of Mr. B. Alexander in San Diego, Cal. The arrangement of the set is novel and will present a few new ideas to constructors. Personally, we'd feel much more comfortable with a sheet of half-inch bakelite between our skinny knees and that closed circuit, but maybe 6WN just took it off to make the photo. He writes us about local affairs as follows:

"I'm but a small ham (hamlet); my name is BonAmi—'haven't scratched yet', but want to chirp now and say that I am going to bite holes in the air so big that it will make a doughnut look sick.

"Per Operating Dept., Pacific Division, August, QST: Some one put on the soft pedal when they played that tune 'The Arc'. Man, that thing is a wonder. NPL

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—Noisiest Plant Loose. It stopped once for a whole half hour and the Tower of Babylon was a side-show compared with the multitudes trying to use the air from San Diego. I have cussed and discussed



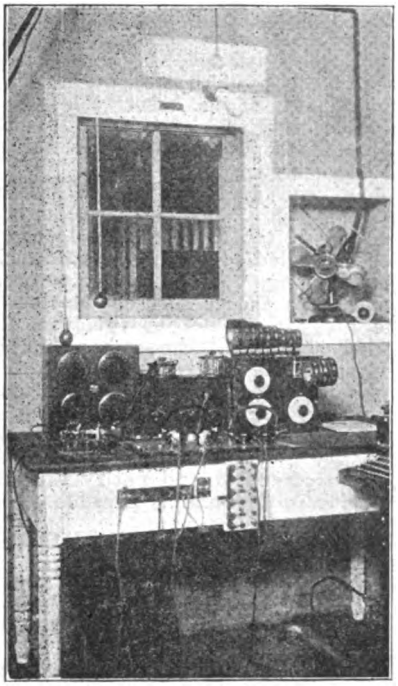
that Poulsen; in fact, so have others, but —. I tuned into her once for a little practise in receiving. Say, a gatling gun doesn't shoot as fast as I thought it did. The run that stuff thru a sausage machine. Wouldn't it be wonderful—if the Old Man could get an ear full of it! More waves than the ocean has—that's what makes the ocean roar so (and us hams, too.)

"Now that I have that off my chest I'll say that enclosed you will find a picture of my station. Note my two doughnuts and circular buzz saw on the second floor; first floor my steam gauge. Does it work? Well, if it does it's got me beat—I haven't worked for two months. Oh yes, there's a two-step, variometers, and some other trinkets that are not in the picture. If you don't want to spoil a good magazine, just drop the photo in the basket."

5AE, HOUSTON, TEXAS

5AE is the station of Mr. L. Peine, Treasurer of the Houston Radio Club, and promises to be a prominent figure in relay work this winter.

The photograph shows only the receiver, which consists of a Grebe CR-4, homemade detector and two-stage, homemade long wave receiver using honeycombs, and Baldwin phones. The transmitter is mounted on a shelf near the ceiling, with the changeover switch controlled by the cords with knobs as shown—rather an unusual idea in amateur construction. The noise-maker consists of a 1KVA Thordarson transformer and oil condenser, homemade OT and homemade rotary, the latter having 4 stationary studs set in a ring, with a 2-stud rotor turning 6000 RPM. The antenna is a 4-wire inverted L, 50 ft. long, 35 ft. high at one end and 70 ft. at the other, with the lead-in from the lightning switch of ½ in. copper tube.



SOME MORE C.W. IDEAS

(Concluded from page 20)

I have found that the most satisfactory conducting cable for this work can be made of eight strands of No. 26 DCC wire, twisted with a hand drill; but if one is using over 100 watts, about 12 strands of No. 26 spaced with paraffined cord will give good results.

Our antenna inductance, for a wave of 375 meters in connection with an antenna of about 300 meters natural period, is five inches diameter and has 80 turns, 16 of which are in the plate circuit. It is essential that a variable of about .0005 mfd. be shunted across the inductance as shown.

Using four VT-2's with a filament current of 1.2 amperes each, our present antenna current on 375 meters is 2½ amps. 4XB works on CW every evening at 10:15 Arlington Time—375 meters.

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NORTH DAKOTA RADIO ASSN.

Thanksgiving Convention

All amateurs, particularly in the Dakota Division and Manitoba, are hereby invited to attend the annual convention of the North Dakota Radio Association, to be held in Grand Forks, N. Dak., November 26th and 27th, the Friday and Saturday after Thanksgiving.

It has been decided that, inasmuch as the membership includes residents of several states, the name of the Association shall be changed to one more appropriate. A committee has been appointed to present this matter at the coming convention.

The program is not at this time fully arranged but it will be a bang-up good one, to cover the greater part of two days, ending with a banquet Saturday evening. For further information write the secretary, Mr. R. H. Pray, 813 Fifth Ave., Valley City, N. Dak., Radio 9ZX. All expecting to attend should notify the secretary as far in advance as possible.

THE PORTLAND CONVENTION

There is a red circle around Sept. 15 on the calendars of Maine amateurs. On that date they held their first Convention, with the New England Asst. Division Manager, Mr. H. W. Castner, presiding, in the city of Portland. About a hundred and fifty amateurs, from all over Maine and adjoining sections, were present. It was the grand get-together meeting to start off the season's work, and resulted in a great impetus to relay affairs. Great things are looked for from Maine this winter, for the eastern route to Canada runs thru there and several Maine stations have been QSO the Canucks. At this meeting valuable and instructive talks were given by Radio Inspector H. C. Gawler and Messrs. Hiram Percy Maxim and K. B. Warner, respectively president and secretary of the A.R.R.L. Mr. Gawler, incidentally, stated he was authorized to announce that in the near future the Radio Corporation of America would launch on the amateur market a full line of high grade tubes, both for receiving and for transmission, at reasonable prices. This announcement certainly got an enthusiastic reception. Most of the Maine District Superintendents were there to be heard from, and all the amateurs wore tags bearing their call letters. Plans were made for the winter's work, and the route thru Maine seems assured.

Vermilya, of 1HAA, attended the meeting and was given a rousing reception. After he returned home he wrote us as follows:

Marion, Mass.
Sept. 16, 1920.

Editor, QST—

Trust you will allow me a few words to the Brother Amateurs that attended our Portland Convention. Our time was limited and I did not have the opportunity to speak with them all personally. I feel that QST is a good way to do so now.

You fellows made a most wonderful showing. I was indeed surprised at the number that turned out and we certainly had a wonderful time. You can look the whole country over and if you try your hardest it will be impossible to find a better, bigger or squarer Radio Inspector than rules our district. Fellows, he's with you, heart and soul. He is typical of the Amateur and QST—noncommercial. He'd rather have been with us last night than with any other bunch of radio men. It is truly wonderful, and we have much indeed to be thankful for in having such a liberal man as Mr. Gawler is.

Last night was my first meeting with Mr. Maxim, our president. Never have I met a more enthusiastic and loyal man to our cause. To have such a leader for our president is beyond the power of all words to describe.

Organization is our watch word—it's positively imperative! It's our duty! I am not trying to sell QST's or memberships to the A.R.R.L. and neither is Mr. Maxim or Warner—and I don't get paid for writing this letter or my humorous stories—it's a pleasure—I love the game. But do, fellows, for your own sakes, get in—subscribe for QST and join the league. It gives you and your station prestige even if you never handle a message. QST in my mind comes even before your tuner or your bulb or whatever it might be you are thinking of buying.

The very fact that you can read a minute description of such stations as 1AW, 2JU, etc., is worth the cost of a year's subscription. Think of being able to plan your station after these stations which have such marvelous success. Their junk pile represents their experience and hundreds of dollars. What they have found not of value has been cast aside. By following their stations you are spared the necessity of buying something to just "see" if it will work. Let their stations be a guide to your purchases.....

I thank you all most heartily for the kindnesses shown me while in Portland. 73's.

Very truly yours,
Vermilya, 1HAA.

THE RADIO RESEARCH CLUB OF NEW YORK CITY

The reorganization meeting of the R.R.C. was held on Friday evening Sept. 24, 1920. The members of the club were once more re-united after a suspension of

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the club's activies during the summer. Many plans were made for the coming season and the club's set will be rewired and put in first class condition. As soon as the reorganization is complete the club will be able to become a link in the great chain of the A.R.R.L.

PHILADELPHIA AMATEUR RADIO ASSN.

The Philadelphia Amateur Radio Assn. opened their winter season with a meeting on Sept. 20th. The meetings this year are held at the Building of the Free Library of Philadelphia, H. Josephine Widener Branch, 1200 North Broad St., the first and third Mondays of every month, at 8 p.m. All amateurs and their friends are invited.

RADIO TRAFFIC ASSN., BROOKLYN

Copies of the first fall issue of the Radio Traffic Bulletin, our organ, have been mailed to more than 100 radio associations throughout the United States.

Fifteen of these associations are exchanging Bulletins with us or have requested the R.T.A. to place their names on the R.T.B. mailing list.

To the remaining clubs we invite an exchange of Bulletins believing that such action might be of mutual interest in the development of the club papers, which in turn would be to the general benefit of the members of the associations.

Bulletins received from other associations will be posted on the R.T.A. bulletin board at club meetings and it is understood that the R.T.B. will be made available to the members of other clubs.

To associations not issuing a Bulletin at the present time, but who are contemplating doing so, the R.T.A. will be pleased to furnish any information, gained thru the publication of the R.T.B., as to general expense, equipment required, etc., upon request.

Address Ernest K. Seyd, Editor, 531 Washington Ave., Brooklyn, N. Y.

ESSEX COUNTY RADIO ASSN.

One of the livest of the many clubs affiliated with the League is the Essex County Radio Assn. of the County of that name in Massachusetts. Mr. F. Clifford Estey, of Salem is their indefatigable president, and is accomplishing a splendid work for Amateur Radio. The club consists of a number of sections in the various towns within the County, and regular meetings are held by each section. The association is a real, peppy outfit, and deserving of the support of all amateurs in Essex County. If there are Amateurs in any part thereof which has not yet a section, they should communicate with Mr. Estey. Haverhill amateurs are requested to get in touch with Mr. T. T. White, 66 Portland St., Haverhill; Lawrence amateurs, with Mr. W. T. Nesbit, 13 Wellington St., Methuen, 1VAS; Andover amateurs, with Mr. Horace Goss, So. Main St., Andover, 1SAY; and Gloucester amateurs, with Mr. W. P. Wheeler, Y.M.C.A., Gloucester. Anyone interested in radio is welcome at any of the meetings.

The idea of County radio Clubs was expounded by Mr. Gawler before leaving the inspection service. It is a fine idea. The Cumberland, Essex County and Worcester County, radio associations speak well for the plan. The various cities in their respective counties get together and form the large organization. They each become chapters of the parent club. Meetings are held regularly at the various cities and all the members of the various city clubs, or chapters, meet together in that ONE city. The next meeting is held at another city. In this way a large assemblage is possible and outside speakers are more easily obtainable. Lets have more COUNTY radio clubs.

Boston has a C-W club whose members are C-W owners who are getting together to pool information from the practical side of the art. It is made up of the older amateurs and those wishing further particulars should address the Secretary, Room 20, 18 Boylston Street, Boston, Mass. The first meeting was held Oct. 14. Regular monthly meetings are planned this Fall.

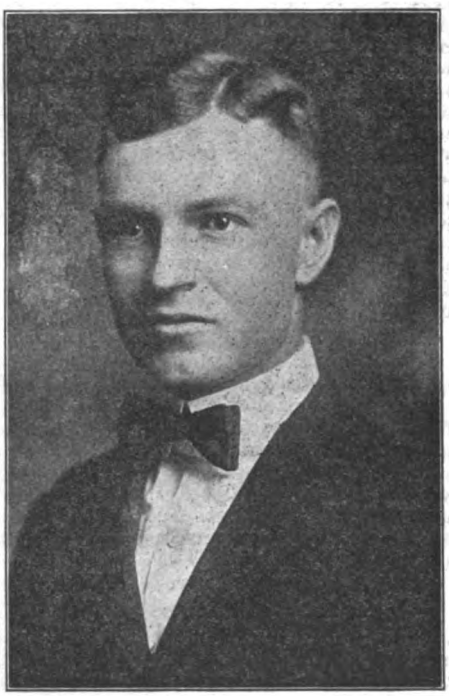
The Northwestern Radio Association of Portland is assuming normal proportions with the opening of fall. Steps have been taken by the same organization with the view of doing away with unlicensed transmitting stations. A committee has been appointed and the city divided into a number of districts, with a prominent amateur in each district as supervisor. It is the duty of these supervisors to keep close tab on all stations in his district and to report all new ones being erected. These new stations are visited by the committee and if no license is procured within a reasonable time they are turned in to the radio inspector, who takes the case from there. This has been found quite effective, as very little trouble has been experienced from licensed stations.

NEW HAVEN RADIO ASSN.

The New Haven Radio Assn. in August commenced the publication of a monthly club organ entitled "Club News". Its pages are typewritten and neatly bound in a size about the same as QST, and all the local doings and gossip are chronicled. Splendid! A good idea for other societies.

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RAYMOND L. WHITE

Introducing Raymond L. White, A.R.R.L. District Superintendent of Northern Texas, Ennis, Texas.

Born on August sixth, 1897, in Gurdon, (.— .—. —.—) "Arkansaw", his people moved to Texas when he was only about one year of age, locating at Hillsboro, later residing in Dallas, and now located at Ennis, Texas, where he is the owner of station 5AP, which has done some splendid relay work during the past season.

Mr. White began his association with radioites at the tender age of about fifteen, and was inoculated by the bug in 1916 to the extent that he became the owner of a quarter K.W. station in Dallas.

He was formerly with The United Fruit Company, known as the old Tropical Radio Tel. Co., operating their well equipped wireless plants aboard ship between New

(Concluded on page 45)



CHARLES CANDLER

La-a-d-ies and Gen-n-ntle-men-n! Behold the Senior Operator from 8ER, St. Marys, Ohio whose spark is known over most of North America—Prof. Chas. Candler.

Mr. Candler was born in Ohio in January, 1884, and insists that most of his life has been uneventful. He made his A.B. degree at Miami (Ohio) University, and has been in school work ever since, being at present Principal of the St. Marys High School. He first became interested in radio six years ago, starting with a one-inch spark coil, crystal detector, and loose coupler, and in 1915 acquired 1 K.W. and an audion, and abused the ether with 133 cycle static and signed off 8NH. Since the war he has been at it again, this time with 60 cycle juice and the call 8ER, to whose phenomenal range most of us can

(Concluded on page 54)

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Say Eddy:

Kid Useless out here wants to know if a Ham (F.) is a Lady bug. Answer per QST.

Yours, V.T.

Dear V.T.—

Questions concerning Anything (F.) are beyond us. We've found out that we don't know anything about 'em. But why not?

Yours, Ed.

Don't bury chicken wire—try cutting out some of your ground resistance with an ohm-saw.

Several replies were received to our inquiry about log systems. Most of them use the same method—a sheet ruled with three narrow and one wide column, headed, respectively, "Station Heard", "Station Called", "Time", and "Remarks". Ye Ed used to reverse the order of the first two columns because it is the calling station whose sign is heard last, and he also found it more convenient simply to note the passing of each five minutes in the time column, eliminating the bother of clocking every entry.

The ratings of the Ediswan tubes mentioned in the September QST are the input watts, and not the output.

Why not a commutator interrupter, driven by a small synchronous motor, to give us a positive 240-spark note on the Amrad? And experimental synchronous motor can be made using an iron spider casting for an unwound rotor, with a simple two-pole field. Because the break would be much faster than the sine wave of the regular current, the induced voltage would be much higher, which is also desirable on these gaps.

Division Manager Pray, of Valley City, N. D., wants us to tell the bunch that he is no longer 9EE, that call having been reassigned some time ago to H. J. Goddard, at Ellendale, N. D. Goddard is reaching out, and Pray gets all the post cards. Pray's present call is 9ZX.

Who was it a few months ago that heard FFF, or some station sending a string of F's? Man, dear, FFF is in Sofia, Bulgaria. Dijah, honest?

In our October issue, Speedo Vermilya's aerial is described as having 20 wires, whereas our photo plainly shows it has only 14. Twenty is correct, and it's Vn's fault—he traced them in in pencil, and Hick, our artist, did the rest. Anybody else wishing to lose 30% of their aerial in two minutes, please see Mr. Hick.

With regret we chronicle the death on August 3 of one of our members. Mr. Walter Blust, Radio 9ACG, Sheboygan, Wis. Blust was born in Rio de Janiero in 1901, came to the States in 1905, and became a ham in 1916. At the time of his illness he was engaged in preparing his station for this winter's work. He was a member of the Sheboygan Radio Assn. (affiliated), and his loss is keenly felt.

The June 24 issue of Hardware Age contains an interesting account of how the American Hardware Stores, Inc., at Bridgeport, Conn., came to handle radio apparatus and material for the local experimenters—all because they kept dropping in the store for binding posts or brass rod or something. Now they have a regular radio line, in charge of their enterprising Mr. E. J. Reidenouer.

This from a California newspaper:

"Exchanges are commenting quite freely on the enterprise of the Placentia jeweler who has installed a wireless telephone. This kind of work may be all right for kids and indeed has been quite general with them since the beginning of wireless, but seems "small potatoes" for a grown man. It amounts to simply eavesdropping, something not usually commended. Imagine a business man giving up his time to "listen in" on a telephone conversation".—Brea Progress.

Oh, Ignatz, if you only knew!

The Berne Bureau announces new international abbreviations as follows: QTC?: "Have you anything to transmit?" QTC: "I have something to transmit" or "I have one or more radiograms for—". QRU? is abandoned as a question, and QRU has the signification "I have nothing

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to transmit" or "I have nothing for you". We're sure we don't know what was the matter with QRU? but let's keep up with progress, change our cards according to the above, and ask "QTC?" next time.

The A.R.R.L. is endeavoring to secure official international recognition of our amateur symbol, QSS, for the fading dope we now use it in.

This is Mr. Snorri P. B. Arnar, of Reykjavik, Iceland, for many years a reader of QST and highly interested in amateur radio. Mr. Arnar is employed at



the wireless station at that point, which from its photographs, seems to be Marconi-owned. He will probably be surprised to see his photograph in QST—we got it from Mr. Kirwan of Tresco.

On page 33, August 1920 QST, call 5CC was erroneously shown as Corlett, Dallas. Correct QRA of 5CC unknown to us, but Corlett is 5ZC, 200 meters normal sending and receiving wave, 375 meters sending when requested.

It is rumored that 1BBL is putting in a still.

A recent issue of our British contemporary, "The Wireless World", described experiments in loop reception making use of a much smaller loop concentric with the main loop and connected for feedback—a Reaction Coil, as the English call it. This makes the loop a regenerative set, with great increase in signal strength, and no serious effects on the D.F. qualities of the loop. We do not know why the simpler process of tuning the plate circuit with a variometer wasn't used instead—it should work better.

Mr. A. H. Wood, Jr., designing engineer for the Clapp-Eastham Co., has withdrawn from the radio field and entered the advertising business with the firm of Wood, Putnam & Wood, at 178 Fremont St., Boston. Our best wishes, A. H. You'll be back.

To work telephone a few blocks not a thing in the world is needed except a microphone and the regular receiving set. Put the microphone in the ground lead, start the bulb oscillating, tighten the coupling, and talk. (If the A. T. & T. don't like us amateurs, maybe it's because we keep thinking of things like this to do with pieces of their perfectly good telephones.)

From some bright answers to license exams which 8ZW, an ex-inspector, sent us, we present this gem: "More than one wire will increase the capacity of an antenna. Care must be taken that the wires are at least two feet apart, because all the wires are charged at the same time and would therefore repulse each other."

WOULDN'T IT BE WONDERFUL—

If the Navy would let radio legislation alone?

If 1DQ would come down off of 2500 meters?

If 5CD would loosen up that O.T.?

If Cutting & Washington would put some of their apparatus on the amateur market instead of talking about it so much? (Why not both, OM?)

If those U tubes would hurry up?

If 1HAA grew up?

Possibly our readers will be interested in a description and photographs of the store maintained by the Atlantic Radio Company of Boston, Mass., whose advertisements are a regular part of QST.

Although one of the newest radio concerns, its rapid expansion from the date of incorporation, July 1919, has been phenomenal. The original store was opened at 34 Batterymarch Street but before five months had elapsed it was evident that the floor space was too small to take care of the rapid growth of the business. Accordingly in April, 1920, the organization moved to its present quarters, 88 Broad Street, comprising an up-to-date store, a large shop for special work, and a laboratory on the top floor of the building. In addition an efficient antenna system was installed on the roof.

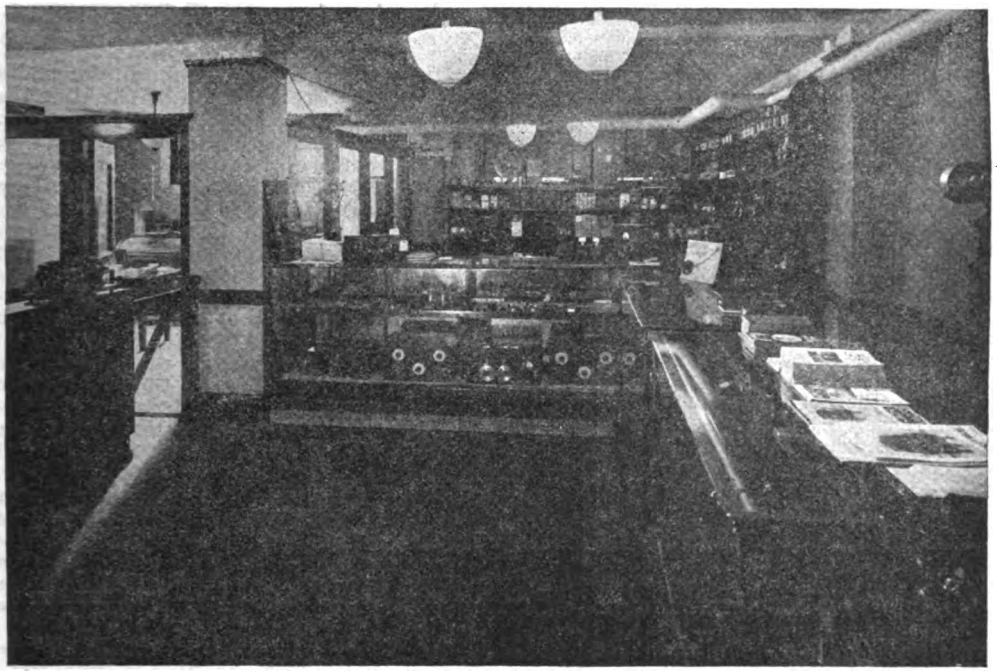
On July 6th the first branch store of the company was opened at 15 Temple Street, Portland, Maine under the management of Mr. H. W. Castner. Mr. Castner is a well known radio man in eastern radio circles and the company was exceedingly fortunate in obtaining his services.

Two interesting products have been

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brought out by this Company, notably the A R.Co. variable condensers and the A.R.Co. amplifying transformer. Other units of equal value are promised in the future.

At the head of the organization is Mr. F. Wigglesworth whose personal interest in Radio is largely responsible for the success of the Company; Mr. H. St. John Smith, purchasing agent; Mr. George L. Aspinwall, in charge of shipping and mail orders; and Mr. E. P. Gordon, advertising manager, are the remainder of the governing personnel.



New Books Received—Consolidated Radio Call Book, second edition. The only call book we have at present and the appearance of which has been expected month by month since March. 160pp., 6x9, paper covers, published by Consolidated Radio Call Book Co., 41 Park Row, New York, $1.25. Contains conprehensive lists of ship calls alphabetically by names of vessels, shore stations alphabetically by countries, high powered stations of the world and their wave lengths; a recapitulating list of all classes of stations alphabetically by calls; a list of amateur stations ending with 1HAZ, 2AHN, 3PU, 4DB, 5WZ, 6PH, 7FZ, 8ABW, 9ACS; a list of "specials", alphabetically by cities for the entire group—a most unfortunate arrangement, as it is almost impossible to find a QRA as it is—would be much improved by listing alphabetically by calls in each district; miscellaneous information on rates; compass stations; press, time, and weather service, etc. This book fills a keen need—even if it does list 1AW as "Hartford, Mass."

5ZU has spent considerable time, money, and cuss words try every conceivable kind of ground in an effort to increase radiation including a big cistern full to the top with water, chicken wire, buried wires and counterpoises but 3 amperes is all there is to it. Can any one help him?

Houston Amateurs have been having considerable trouble with Amplifying Transformers going dead, stations not having adjacent transmitters experiencing the same trouble as those with them. A total of 21 transformers were lost by the club members during the summer. Can someone offer a remedy, a preventive, the cause or cure for this trouble?

RAYMOND L. WHITE

(Concluded from page 42)

York and Panama, and is known among the bunch as "AN". But this did not prove as interesting as the amateur work, so he resigned and came home and brought station 5AP into existence.

He is true blue A.R.R.L., a good booster, and a splendid organizer, and says he is with us henceforth and forever.

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FAN AERIALS—WHO CAN HELP?

416 Court House,
Minneapolis, Minn.

Editor, QST:

Last spring you wrote me about our antenna at 9ZT requesting further information. At that time we were using a two wire vertical fan about 355 feet above the ground and 260 feet long, the station being on the fourth floor of the municipal building. This antenna ran up the side of a stone tower and, although there is no metal in the tower except the chimes and staircase, it seemed to shield us from all signals from the north. In fact I believe the tower reflected the waves to the south, as it seems unusual that a ½ K.W. transmitter could work south as well as we did. As per June QST we were heard 2,200 miles in that direction over land and mountains mostly, while at the same time being rarely heard a hundred miles to the north. Lightning brought down this antenna, shattering the large insulators when it jumped from the ungrounded tower to the grounded antenna with a direct hit. In designing the present aerial, which is of the vertical fan type, I made a radical departure from all former designs of this type, believing it to be superior from a theoretical standpoint and my theory checked after it was constructed.

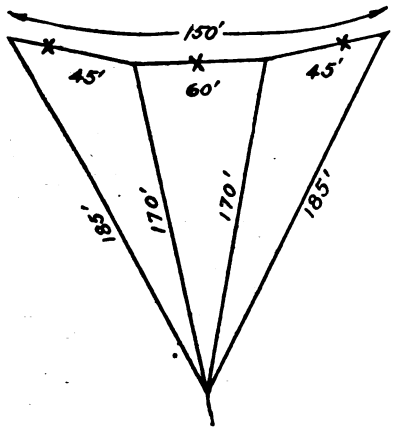
In looking at the picture of 9ZN I couldn't help but think how much longer the outside leads of his fan were than the middle ones. Now it appeared to me that if each wire were taken separately, their fundamental wave lengths would greatly differ and I fail to see how they could all be of the same wave length when connected together. Amateurs with "T" or "Inverted L" aerials are always careful to have all wires of the same length, for we would laugh at an aerial with insulators strung along the flat top at different lengths from the lead-in. Imagine a "T" type with excessive sag or an "L" with the free end raised above the lead-in and you are not very far from the vertical fan type, but at what point in this gradual change does it matter whether or not the wires are all of the same length? Imagine an electron starting up each of the wires in the average fan antenna. These electrons all travel at the same speed and the ones that went up the shorter wires will reach the nodes and get back to the lead-in by the time the ones on the outside track have just gotten well started down. If the antenna is grounded and of not too high resistance there will be free oscillation of electrons up and down the antenna until all the energy is dissipated due to radiation, absorption, and conductor resistance losses. The length of time for these electrons to traverse the antenna system is the determining factor of the wave length and if each wire has a different period of oscillation how can the fundamental wave length be definitely at one value? Continuing the discussion about these electrons, what happens when the electron from the center wire gets back first and starts up again on all wires, as they are all connected together, and meets the others coming down? Perhaps it neutralizes the second one and leaves the rest of them to fight it out among themselves as they arrive upon the scene in pairs later, but more probably it just takes some of the pep out of all of them, and the second likewise does the same to the third; that is, what there is left of it after the first combat. The resulting distributions of voltage after two or three oscillations become quite complex, it would appear. If the top and supporting wire of the fan has considerable sag in it, the fundamental wave lengths of the individual wires will differ greatly. As the wave length is about four times the length of the wire in each case, some idea may be obtained as to the probable broadness of the resulting wave of an antenna of a dozen wires each differing from the next by five meters wave length, which would be about four feet of wire difference. If my notes are correct, I believe I heard Mr. M. B. West, at the Central Division Convention at Chicago, remark that the more wires added to a vertical fan antenna, the less sharply its fundamental tunes. This was in connection with his explanation of his favorite hobby of chopping up a perfectly good antenna until it gets the "blues". He drew a curve which was very peaked, representing the tuning of a two wire vertical aerial, and another, much broader, with a poorly defined maximum point, which he said was the result of adding more wires in the form of a vertical fan. He said that he considered two wires of great height and diverg-

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ing upward, the best antenna. Doesn't my theory explain this?

It appears to me that there are three possible remedies to the fan antenna to make it O. K. The first would be to make the support in the form of a circular arch bending upward with the wires as radii; the second method would be to place insulators part way down the outside wires making the active parts of all the wires the same length; and the third method would be to properly space the wires along the top wire. The first two methods are out of the question for constructional or efficiency reasons, so the last will be considered.

If a vertical wire is tipped somewhat out of its vertical position, its wave length is increased very slightly. It it impossible to say just how much this would be, but unless the deviation from the vertical was excessive it would not amount to an increase in wave length enough to be measured. Therefore, in the following, for simplicity the wave length is considered to be proportional to the linear length. The down wires of the fan should be in good electrical connection with the top supporting wire. That sounds simple enough, doesn't it? The only thing that requires any figuring is the spacing of the wires at the top. The whole thing, in a nutshell, is to so space the down leads that the total distance up one lead and across the top wire to the next lead and down that will be the same for any lead with its adjacent one. If these loops all have the same total length no matter between which two adjacent wires figured, the space between the wires near the center will be greater than between wires nearer the outside, measured along the top wire.



Perhaps the example of such an antenna at 9ZT will better illustrate what I mean. The top wire is 150 feet long and was first hoisted with cords attached and the length of these cords measured from different points along the wire to the lead-in bushing with liberal allowance for sag due to the weight of the wires later. It was found that the final length of four wires would be 170 and 185 feet for each pair. Letting X equal the space between the two on each side of the center, the total distance around the inside loop would be 2 (170) plus X, which should equal the distance around one of the outside loops, which would be ½ (150-X) plus 170 plus 185. It figures that making the space between the innermost wires 60 feet, and between each of these wires and the outside wires 45 feet, that the total distance around any adjacent pair would be 400 feet. Our little electrons may now scamper up and down the wires to their heart's content and will bump into each other after they have gone 200 feet and then will run down again, meeting at the same time at the lead-in. It is perhaps interesting to note that there are three places in the antenna at which there is no current flowing. These are 200 feet from the lead-in and come at the center of the top wire and 15 feet from each end. Insulators may be inserted at these points if desired but there would be no use as there would be no difference of potential across them. These points are the places of highest potential with respect to the ground or counterpoise, and are the nodes for current. I must admit I haven't tried connecting a hot-wire milliammeter across these insulators because I couldn't find a powerful enough telescope to watch the needle on the meter scale.

With the same wave meter and under the same conditions of excitation, I find that the fundamental tunes just as sharply as the old antenna of two vertical wires. Personally, I don't see the need of a large number of wires in an antenna, and believe that a few, of good high frequency conductivity, are all that is necessary. There is also a practical limit for each antenna, for as the number is greatly increased, the distance between those near the outside of the fan becomes smaller.

In conclusion, I wish to state that though I am not yet a radio engineer, I believe the above to be a fact as I see it from what I know about it. So far as I know, 9ZT has the only aerial constructed on this principle, but I would like to hear what other fellows think about this. I know there are lots of fan antennas constructed along the common lines of equal spacing at the top and I would like to hear from the many users of this type whether I am right or wrong, and what they think about it. Well, enuf for this time, Eddy. CUL 73.

Yours till the Grid Leaks,

Boyd Phelps.

(We invite comment. There is a dearth of data on aerial design. We used to think

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that the capacity of the whole aerial system was about all that mattered, but now we don't know.—Ed.).

REPORTS FROM SEA

S. S. City of St. Joseph (KOSM),
At sea enroute to Barcelona, Spain,
September 1, 1920.

Editor, QST:

I am sending you a list of wireless call letters of some Amateurs and the time which they were heard during this trip over, and I hope it will be of interest to readers of the well known QST.

While visiting my home last trip after coming back from Italy and Egypt I happened to be reading through a copy of the QST which is being sent to my home address as it was in the old days when it first started. I read an article asking for some of us "Comm. Ops" to listen down on a low wave once in a while, and still being an amateur at heart though in the commercial game, I said to myself "that is what I will do during some spare minutes at nite after getting NAA px". So OM here is what I heard:

4:30 GMT 8/25/20 i.e. 11.30 p m. ur time 8/24/20. 8DV de 3JZ. His sigs QSA. Slight QRN.

5:00 GMT 8/25/20 i.e. Midnite ur time 8/24/20. 1AW. 9HR de 2NF. Sigs QSA. Slight QRN.

At this time we were 1000 miles east of Cape May, N. J.

Next nite.

4:10 GMT heard 3JU call an Eight station but was QRM by a ship on 300 so missed call.

4:15 GMT heard radio phone on 200 meters but voice faded.

4:30 GMT heard 3JU de 1HAA one msg. Then got the following of the message so he will know just how his signals are carrying. to A.G. Nic... 15 Irving Place... (much QRM from ship close by on 300).....Mabel leaving here Sunday regards.... Could have copied every word if it had not been for that ship on 300. Could hear 1HAA about three inches from the phones. At this time we were approximately 1275 east of Cape May, N. J.

Perhaps it will be of interest to know that only a one step was used and the receiver is of the well-known Navy Standard.

I hope that the above will be of interest to the owners of the radio stations and would be glad to hear from them as to what kind of transmitter they are using. My address is care of Baltimore-Oceanic S. S. Co., Baltimore, Md.

My radio station, which was 3UZ before the war, is now 3BA and operated by my brother, so if any of you fellows hear 3BA please drop a card.

Guess I have taken up quite a bit of your valuable time OM so will close with best 73's to the "bunch" and wishing the A.R.R.L. and the "QST" the best of success in the world, I remain

Yours till the static dies,
Thomas W. Braidwood.

(Fine, KOSM, and we thank you cordially. Please keep it up and ask your operator friends to help. You can see it is mighty interesting both to you and us.—Editor).

WHAT HAPPENED IN EARLY OCTOBER?

Brooke, Va., October 9, 1920.

Dear Friend Warner:—

Would certainly like to know what has happened to the short wave radio now, or if the experiences observed here are the same elsewhere for ever since the 2nd of October conditions have been most peculiar.

As you already know, under ordinary conditions with my present aerial the Second district stations rank first, with the third district a close second, and the first district third, while the fouth, fifth and eighth and ninth are rather indifferent with the exception of a few "regulars" in each.

Now commencing with the second of October and continuing up to and including last night, not a sound has been heard from the first district and the second and third district stations are almost as quiet, and strange enough what few of the second and third I do hear are all stations I have never heard before Even 3BZ does not come.

On top of this the fourth stations show a big improvement over ordinary conditions and the fifth and ninth are still better than the fourth while the eighth work indifferently—good one night and bad the next.

The most noticeable peculiarities were on the second the only stations heard at all were 9AEQ, 5ZL, 4XC and a few 2's. On the third all I heard was 9GN, 9LA, 8AJW, 4DM, three twos and one three. Such as this has been kept up night after night until last night where it seems the climax has been reached, when the only station heard at all loud enough to read through the QRN was 5ZP who was very QSA. Now 5ZP is nearly 1000 miles south of me, and why should this station pick its way through all that distance when nothing else at all would do so? It is also well to note that 5ZP was working 8DI, copying him without trouble while 8DI had trouble copying 5ZP, judging from the repeats that he was compelled to make, while 8DI could not be heard at all here but ordinarily is one of the best 8's I get, and was very QSA on the fifth.

Evidently the wires are crossed somewhere. I also note the following letter

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from 3CA, Roanoke, Va., under date of October 4th.

""Tonight heard 2BB, 8IN, 8EN, 9GN, 9KU, 5BL and several other DX stations, but could not get a single one close to me, not even 3RF who is within 4 blocks of me".

Let's see if anyone else is having the same troubles.

Sincerely,
A. L. Groves.

ULTIMATE DX

East Orange, New Jersey,
August 10, 1920.

Editor, QST:

Perhaps some of your readers may be able to give me a little light on this subject!

John has a 1KW station. James only has a ¼ inch spark coil. John, of course, will hardly speak to James because he (John) claims he can transmit 2000 miles. He means to imply, I presume, that, with the average PRESENT-DAY equipment at the receiving end, his set will transmit signals that are audible 2000 miles away. For, the distance to which ANY station can actually transmit is, to my way of thinking, INFINITE! And all this REGARDLESS of the size or location of the transmitting station or the amplitude of the transmitted wave.

Take, for example, the analogy of a stone thrown into a pond of still water. When the stone strikes the water it causes circular ripples or waves to be sent out in all directions through the water; the point where the stone struck, forming the center of these circles or waves. Now, as the waves travel outward and away from this center of disturbance, they become less and less well defined until a point is reached where they are imperceptible to the human eye. We are led to believe, in consequence, that they are "absorbed". But, are we, therefore, to assume that, because they are APPARENTLY absorbed, that they, in reality, travel NO FURTHER? Had we delicate and sensitive enough instruments at our disposal, it seems highly probable to me that we could detect the presence of these waves at the VERY EXTREMITIES of this body of water, REGARDLESS of the size or magnitude of the transmitted wave. And we could detect the presence of these waves at the very extremity of this body of water entirely IRRESPECTIVE of the size of the body of water, providing, ONLY, that our instruments of reception were sufficiently sensitive. This seems to be a perfect analogy to the transmission of electro-magnetic waves termed "wireless". Given an infinitely sensitive receiver, what is to prevent the reception, in China (or Mars), of waves emitted from a BUZZER that is located in Alaska?

To me the development of a REALLY EFFICIENT receiver contains unbounded possibilities and comments from your readers will be doubly appreciated.

Cordially yours,
George N. Garrison.

D. C. FOR C. W. TUBES

701 West 179th Street,
New York City.

Editor, QST:

I was particularly interested in your article in the September issue—"A Few Ideas for Amateur C.W." From the tone of that article and conversations I have had with amateurs of my acquaintance, I judge that the greatest obstacle to be overcome is the obtaining of the high-voltage D.C.—were it not for the difficulty encountered here it is quite probable that C.W. would be employed practically universally. I have a little scheme, which while it may not be a complete solution, will at least form a new field for research and it ought to develop into something. While a patient at one of the largest and best-known sanatoria in this country, I studied X-Ray rather extensively, the institution being equipped with several very fine outfits. For the Coolidge tube, D.C. is essential and is used at potentials from fifty to seventy-five thousand volts and sometimes higher. This was obtained by shooting 110-220 volts A.C. into a transformer and stepping it up to the desired voltage, then rectifying it by means of a disc rectifier driven by a synchronous motor. It seems to me that this method of rectification ought to be O. K. for C.W. At any rate it has the advantages of rectifying both halves of the cycle, and being almost unlimited in the amount of current it will pass. At the voltages used in C.W. work, sparking at the contacts would be negligible. The only disadvantage that occurs to me is the uncertainty of the polarity, but this could be overcome by the insertion of a polarity reversing switch in the primary of the transformer.

If somebody got busy along these lines we might have a simple and complete solution of a problem which at present is preventing C.W. from spreading throughout all amateur radio.

Very truly yours,
Arthur K. Ransom.

A PATENT COMMITTEE

Tresco, Davenport, Ia.,
Sept. 29, 1920.

Mr. H. P. Maxim,
Hartford, Conn.

Dear Sir:

There is no real reason why QST cannot have an up-to-date legal department. A study of some of the lists available show-

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ing the legal talent as members of the A.R.R.L. is convincing that all that is needed to organize this legal department is a call from yourself to the various members of the bar throughout the country to appoint a committee among themselves to serve without pay and give to our magazine regularly clear statements of the patent situation as it happens to be at that time. Without denying any of the inventors their rights under the law, we should surely state what their rights are.

The mere fact of attorneys writing the many manufacturers who are engaged in the manufacture of amateur wireless material demanding a royalty for such-and-such a client may mean that the client and the attorney are under the impression that such a royalty is due. Several interesting reversals of opinion have occurred recently and unless the manufacturers are enabled to employ legal talent to investigate the numerous claims arising they are at a disadvantage. With a great number of the larger dealers who appear to be afraid to take the chance of purchasing various material, this legal help would also mean that all claims would be further investigated.

The amateurs are the ones who are really paying this royalty and it is no more than fair to them that QST should invite such an organization among its members to act as a legal department in such matters, and get their information from the attorneys of the various claimants for these royalties.

Things were so complicated a short time ago that several lawyers for as many claimants were insisting on royalties for binding posts, and a rheostat which had been designed primarily as a dimmer for a Ford headlight This committee of attorneys could act as a body to assist QST and its advertisers, without in any way compromising QST.

The outcome of this arrangement I feel sure would be of considerable benefit to all concerned and publicly air a subject that has been more or less of a mystery to all of us.

Yours very truly,
W. H. Kirwan.

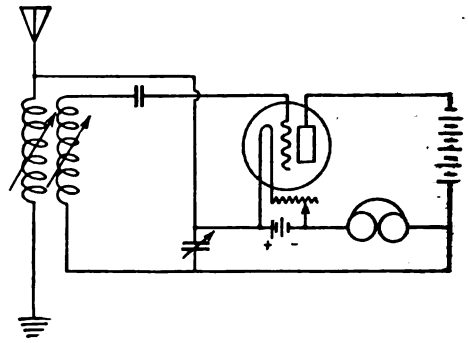
(QST would be glad to hear from any of its readers qualified to act for the good of Amateur Radio in the manner suggested by Mr. Kirwan, and will also be glad to have expressions of opinion from other manufacturers.—Ed.).

ANOTHER REGENERATOR

Manson, Ia.,

Editor, QST:

Possibly there is nothing unusual about this hook-up, but I have never seen it printed. Have tried about everything I have seen in print for use with an ordinary loose coupler without any variometers,



but this is by far the best I've ever used. It seems to have the advantage of maximum amplification of spark signals without distortion of the natural tone of the transmitter.

Yours truly,
Russell Virt.

INDUCTIVE FEEDBACK

Atlanta, Mo.

Editor, QST:

It will no doubt be of interest to those that have the QST regenerative receiver described in January, 1916, QST, to learn that the tickler system can be successfully applied to it, as described in Mr. Alexander's article in December QST. Wind 30 turns No. 26 D.C.C. wire on a tube 35" diam., 3" long. Place this inside the secondary load coil and use the Alexander hookup. It requires close adjustment but when adjusted the long distance amateurs sound like they were only a block away, and the C.W. come in as clear as a whistle.

Yours truly,
Claude E. Ronnjue.

A RECORD?

San Francisco, Cal.,
August 24, 1920.

Editor, QST:

Just a line to let you know that I believe I have broken a record for amateur work at my station 6ZE, working on 200 meters.

On the night of August 9, 1920, I was working with 7CU (Royal Mumford, Vancouver, Wash.) before the QSS test was sent. After 6DY had sent the test, I broke off with 7CU for a minute, and worked 6DY, reducing my power when I did so. After finishing with him, I again worked 7CU. On full power, 600 watts, I was radiating about 4.2 amperes with a decrement of about 0.14; on low power I radiated about 0.85 amperes, and the transformer primary input was 45 watts (FORTY-FIVE WATTS). You may judge of my surprise when I later received a note from 7CU saying that he had copied most of the message I sent to 6DY on this low

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power tap, and that he, 7CU, was using a single tube without amplifiers.

I immediately wrote him for further confirmation, and arranged for the test to see if it was a freak or not. Last night I demonstrated that it was not an absolute freak, as I was able to do even better than that shown above. I called 7CU and worked him on full power, and then cut the power down to the lowest amount I can get a spark on, which is 20 watts, with a radiation of about 0.6 amps., and 7CU heard me, although he said that I was rather weak, and hard to hear through the static, and interference (several nearer stations going at the same time).

The distance from San Francisco to Vancouver, Wash., is about 600 miles, entirely over land, with many high mountain ranges and forests in the intervening country, and I believe that this will almost, if not quite, constitute a record for low power transmission, and shows what can really be done with a little energy properly used, on a carefully tuned transmitter.

I am using a CESCO 1K.W. transformer, 0.012 Dubilier Mica Condenser, a 12 plug rotary making 3600 RPM on an induction motor, and a simple oscillation transformer using 1.25 turns in the primary 10" in diameter, of ½" copper tubing, and 7 turns in the secondary 6" diameter of high tension rubber covered cable. The coupling is rather loose, there being about 4" separation between coils. Have two impedance coils in the transformer primary to reduce the power.

Yours very truly,
D. B. McGown.

GIVE THE FAIR SEX A CHANCE

New Orleans, La.,
August 14, 1920.

Editor, QST:

A great majority of radio bugs will no doubt disapprove of my suggestions in that behalf, because they would rather have the fair damsels where they can throw their lamps on em' now and 'en—so to speak. Especially so now-a-days with those low cut "everythings". You know what I mean. Then you young rascals must remember that there are the serious minded gentlemen who have either lost their eyesight or have been married so long that their only wish is to die. However, they want to see the Radio Female enthusiast given a chance and I am one of those type. I am not married long—well not more than two years (some call that decades)) and I am quite sure my eyesight is not failing me in the least, from what I perceive. And furthermore I have just purchased a good new pair of tortoise shell glasses well protected. Getting our minds back on our subject, let me say that the young woman who has taken any interest in wireless and has progressed up to the rank of a Commercial Wireless Operator has absolutely no chance. I myself know of but one case where a woman was placed aboard a vessel and that was mainly because the Captain was her Father. This very good reason in most cases has nothing to do with it simply because it is the iron clad policy of most steamship concerns not to permit relatives on the same vessel. The reasons are quite evident most times being defined as "partiality" in favor of one or the other. Now we come face to face with a condition which surely should not exist. If a woman be so inclined to take up this fascinating work and as I said before progress to the point where she is able to obtain a first grade license, then why not endeavor to give her the chance she is willing to accept?

Some of you cons on the suffragist ticket might take offense at this, however, let me point out that this has nothing to do with suffrage, and all you women haters put your note books back in your pocket for I am going to suggest something in their behalf.

Everyone who has held an executive position in a Radio Corporation or in a corporation related to Radio in some way or another, knows only too well the trouble experienced in breaking in a female stenographer. The radio terms just make her sick—she never knows (nor cares to know) what you are driving at, and it is only a matter of "reference" to keep up with the work, causing much duplication of work, etc.—ad infinitum. Now then, suppose I suggest to the woman, who is so inclined, that she combine with her Radio Knowledge a thorough Stenographic course. When she obtains a first grade ticket and a diploma from the College or School which she attended, make application with a Radio Company stating that the applicant is the holder of a Commercial first grade license and a Graduate Stenographer. It seems to me that such a position should pay well, in fact much more than an ordinary Stenographer. I myself would prefer to have a woman of this type and it is my belief that it would prove a great asset to any radio department.

Why not then create a title for such skilled Stenographers, one which I will suggest is as follows: RADIO STENOGRAPHER at a salary of $100 to commence and a gradual increase thereafter. What a relief to the already exasperated Radio Superintendent, Inspector, etc. Most of his letters could be handled intelligently without him having to dictate them. It would only be necessary to read such matters of less importance before they go to the mail Dept.

In other words, radio is exactly similar to some foreign language and Stenographers not versed in Radio cannot talk in-

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telligently on the matter in 500 years or more. They are more or less mechanical in their work especially so in taking dictations.

I would certainly like to hear from others giving their views on this timely subject in behalf of the "weaker sex".

Yours truly,
Edward T. Jones.

THE HETEROGENEROPLIODYNATRON

2940 Maiden Lane,
Altadena, California,
August 16, 1920.

Dear Eddie:—

I wonder why Herbert Richter didn't finish his story in the August QST. Guess I'll have to finish it for him.

"The door slowly opened again and Bolsch cautiously stuck his head in. "Might maybe I listen by dat telephone vunce more already?" he asked. "Sure Mike, only look out for those short waves," I told him. He came in and carefully sat down, saying, "All right, I von't touch 'em, maybe you show me some long vuns, yes?" I tuned up on long waves and got POZ coming in strong about 35 per. Bolsch listened a minute, and then exclaimed "Py golly dat's meine liebe POZ!" He grabbed a pencil and started copying furiously, in German. Gonzl and I were flabbergasted and speechless. Finally Bolsch took off the fones, marched to the door, executed a right about face, and with a low bow said, in perfect English, "I was chief operator on the Vaterland and deserted before she was interned. Good evening gentlemen, may I call again?" Gonzl and I were still dumb, and pretty sheepish looking, so Bolsch disappeared through the door with just the trace of a smile, and a merry twinkle in his eyes."

Well OM must QRT. CUL. GN. 73.
("Dad") Paul F. Johnson.

NOTICE OF CONSOLIDATION

Stanford University, Calif.,
September 29, 1920.

Editor, QST:

I wish to take advantage of your columns to announce that stations 6SR and 6AE have been combined and now sign 6AE. Mr. Franklin, the owner of 6SR, and myself will operate the new station jointly, and hope by this change to be able to hold almost a continuous watch without missing many evenings. His sign will be JF and mine FT. We would greatly appreciate any cards that would be sent to us by amateurs outside of California who hear our signals.

Yours sincerely,
Frederick E. Terman.

AN ENGLISH AMATEUR

(The following letter is very interesting in that it chronicles the reception in England of NSF, Anacostia, D. C., which, while not an amateur-owned station, has confined most of its work to amateur wave lengths and has actively participated in our relay and QSS work. To the Old Guard who insist that "the spark is the thing", we present this with our compliments—NSF uses a bulb transmitter.—Editor).

6 West Mall,
Clifton, Bristol, England.

Tresco,
Davenport, Ia.

Gentlemen:

On the evening of July 10th, I was listening in with a companion, a Marconi Operator, using your 20000 meter tuner when we heard NSS with great clearness and copied the whole of the message. We also heard NSF in communication with a U. S. Warship. We also heard NFU, which we have been unable to identify. All these stations we heard quite distinctly and had no trouble in taking down the messages. The aerial used was 70 feet twin wire on a house in the city; the valves, Telefunken; the circuit, the one given by you. Altogether we were listening in five hours. The tuner was never silent for a moment and we received messages from dozens of stations. We considered these results excellent.

Yours truly,
(Signed) W. R. Wade.

EDISWAN TUBES

49 Nanton Avenue,
Toronto, Canada.

Editor, QST:

I noticed a few remarks you made in the Sept. QST concerning the English bulbs as made by the Edison-Swan Electric Co. You speak as if the powers as indicated were output, whereas they are not, and are input. This makes some consderable difference, and is the reason for the low prices.

I have succeeded in getting a batch of the 50 watt size, after waiting some 8 or 9 weeks for same. The tube is a very small one in size, and the elements are about the same size as the regular Marconi V.T. However, the output should be greater.

Hoping that the above may be of some use to your readers,

Yours sincerely,
E. S. Rogers.

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Radio for San Diego Scouts

WITH the passing of the San Diego Exposition, which it will be remembered was held in Balboa Park, the future usefulness of some of the architectural wonders erected for housing some of the novelty exhibits become quite a problem. The Painted Desert was one of the most artistic attractions the San Diego Exposition afforded, consisting as it did of a complete and perfectly modeled Indian Village of the types found in New Mexico, Arizona and the South. Hundreds of thousands of dollars were put into its construction, and when inhabited by the Indian tribe, during the Exposition days, it was the most realistic exhibit conceivable. For some time following the closing of the Exposition the Indian Village passed into the custody of the San Diego Museum, but a greater usefulness was found for it as a headquarters for the Boy Scouts of America, and today we find that the various troops of Boy Scouts in San Diego County have been assigned to the different Indian buildings, while the Executive has his offices in the main building at the entrance, and has established a residence in the former Indian Agent's adobe bungalow at the north end.

Scouting is a movement with a great purpose, namely, the bringing of the boys and the great outdoors closer together than was ever possible before Scouting became organized. Scouting teaches many things, all of them useful, and among the important activities signalling has a prominent place. Now, the requirements for the promotion to 2nd and 1st Class Scout, so far as signalling goes, are not very strenuous. A Scout is merely obliged to familiarize himself with the various codes, and be able to receive and send letters at a low speed. Among the Boy Scouts are found the very best of America's boyhood and it is only natural to suppose that many Scouts have been interested in more advanced radio telegraphy than was ordinarily available thru contact with the everyday troop. San Diego has solved the problem of giving all Scouts the very best possible chance to acquire an up-to-date knowledge of wireless by establishing a first class radio station (6VL) in one of the buildings at the Painted Desert, thru the generosity of the Southern Electrical Company, which presented them with a complete ½ K.W. transmitting set, a one stage amplifier receiving set, and a code practice set delivering a 500 cycle note (non-changing magnetic), and this together with a vertical aerial on a 125 ft. (one-piece) pole which alone cost $450—has given local Scouting a great boost.

The plans as worked out by the Director of Radio Signalling include the teaching of code to the student Scouts, followed by simple theory and the construction of apparatus. Classes are held each Thursday night. When a Scout has become sufficiently familiar with Continental code he is put into the station as an operator's helper. When qualified he is recommended for Government examination and when he has obtained his operator's license is then eligible to take a special examination as follows: 12 word code receiving and sending, a knowledge of Q Signals, knowledge of adjustment of apparatus, familiarity with message forms for relay work. Upon successfully passing this examination he is given a certificate of proficiency which the Scout takes to the local Court of Honor, the Chairman of which is a Judge of the Superior Court, and after being examined in open court is presented with a merit badge which is evidence that he is a 1st Class Scout operator and capable of operating the Painted Desert Station. The classes average about 50 Scouts and the progress made by these boys is astounding. During the first 3 weeks following the opening of the station three obtained Government licenses, and now 6 weeks after the work commenced six are ready to take their special examinations following the Government test.

A fairly complete reference library includes various text books and nearly all radio magazines published. QST will come regularly and is highly esteemed. The plan does not stop with educational work but contemplates the installation of troop stations for each of the several units throughout the County and also the construction and operation of at least one field set, portable, for each troop, so that during field maneuvers Scout Masters may be in touch with general headquarters at all times. It is understood that two other cities on the Pacific Coast have commenced work along the same lines. An official QST is broadcasted every Monday, Wednesday and Friday. Hopes are entertained that soon enough Scout operators first class will be available to stand continual watch, when A.R.R.L. messages will be handled with even greater certainty of "getting through" than is the case with many privately owned amateur stations.

It may be of interest to know that during the period of the annual Summer Camp at Del Mar, a distance of 20 miles from San Diego, from one to four messages a day were relayed from Station 6VJ (Scout Camp) thru 6MZ and 6IY to

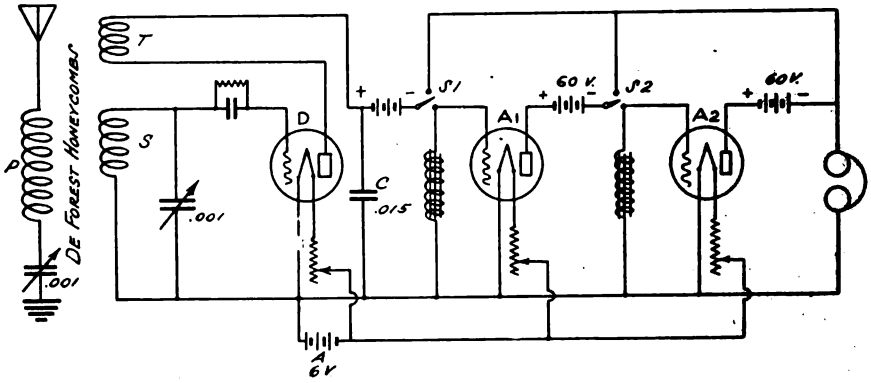
(Concluded on next page)

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Amplification with Choke Coils

By Robert Muns

WHY are all the wireless concerns in the country trying to sell the poor amateurs expensive amplifying transformers? When I entered the Air Service Radio School and advanced as far as amplification, I was handed a diagram of a two-step amplifier using transformers but the instructor said, "We have discarded these sets as they are very inefficient, but you better look this over in case you should run into one some time." With this information we



passed on to the use of choke coils for amplifying.

Since the war I have done considerable experimenting with various chokes and find them 1¼ to 1½ times as efficient as amplifying transformers when using the hook-up shown. The best choke is a section of a 2" spark coil filled with core wire but the secondary of a Ford spark coil works very well. In this case the primary is not used at all. (How could we run a wireless if it were not for the Ford?)

The only disadvantage of this circuit is that a separate "B" battery is necessary for each tube but the increased results are worth it. Besides, the current used from each battery is less, so that the cost in the long run is about the same for batteries but reduced by the cost of the coils. A Ford coil costs about $2.50 while an amplifying transformer is anywhere from $4.50 to $7.50.

I have used up to four tubes with this circuit with no trouble from howling, and think that many more can be added without trouble.

(Editor's Note: The main advantage of a two-winding transformer is that it makes possible the obtaining of impedances in both input and output circuits which are best fitted for the tube used. These values should equal the internal input and output impedance, respectively, of the tube. Another advantage of great importance is the step-up in voltage secured by a proper turns-ratio, so that a transformer-coupled amplifier will reach the possible maximum of amplification with less tubes than one impedance-coupled. There is no question, however, that very satisfactory results may be obtained by the use of chokes, but it must be remembered that the turns-ratio is only 1 to 1.)

RADIO FOR SAN DIEGO SCOUTS

(from page 53)

Headquarters, 6VL. This speaks well for Scout efficiency and was the final proof that those in authority would do well to place better facilities at the disposal of Scouts, in order to advance their knowledge. The Southern Electrical Company stepped in and gave them the apparatus. An interesting rule holds good at Station 6VL, namely, the station is to be used for traffic, and HAMMING is eliminated. The Scouts have, and will make good.

CHAS. CANDLER

(Concluded from page 42)

testify.

QST sincerely regrets its inability to secure a photograph of the far-famed "Mrs. 8ER" at this time, but hopes for better luck soon.

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CALLS HEARD

On account of the vast quantity of calls reported we must ask your co-operation in the following.

(1) List the calls on a separate sheet of paper—do not embody them in a letter.

(2) Arrange by districts from 1 to 9, and alphabetically thru each district; and run them across the page, not down a column.

(3) Put parentheses around calls of stations also worked.

(4) Omit initial or other unauthorized calls.

(5) State the period covered by your report.

1AW, HARTFORD, CONN., Sept. 1 to Oct. 11.
1BM, (1CK), (1CM), 1DY, (1GY), (1JQ), 1QN, (1QP), 1RQ, 1RZ, (1XT), (1XV), 1AAZ, (1BBH), (1BBL), 1DAP, (1EAS), 1FAQ, (1HAA), 1SAS, (2BG), (2CT), (2DA), 2DH, (2DN), 2RK, 2SH, (2WD phone and mod.), (2ZL phone and mod.), 3AB, (3BZ), 3CL, (3DH), 3HJ, 3HN, (3KM), 3LY, (3ZA), (8CB), (8EN), (8GS), 8HG, 8IC, (8JS), 8NI, (8RQ), (8XK), 8ZA, 8ZD, (8ZW), (8ACF), 9ZJ, 9ZN, (NSF).

1KAQ, [illegible]ANVERS, MASS., Aug. 16 on Galena.
1NAQ, 1TF, 1TS, 1UN, 1AW, 2TF, 2NF, 2DN, 2BG, 2EL, 2JZ, 3BG, 8GB.

1AE,
2DA.
(C.W.
2JA.
(2OX
(2RB
2VK
buzze
and
3HJ.
8XK,

1AE,
1RZ.
3GX.
8ABG..
8ER.
8MT.
8ZW.
2JP,
2ZF,

1FB, .
1AK,
1BM,
1DP, 1
1GZ, (
or tel.,
2BM, 2
2OA, 2(
2XJ, 2ZJ (C.W.), 2ZM, 3AA, 3AK, 3AW, 3BF (Canada), 3BH, 3BZ (QSA), 3CC, 3CP, 3DH, 3EN, 3FB, 3KM, 3NB, 3NF, 3NV, (3HJ), 3OB, 3PR, 3ZW, 3BM, 8AA, 8AK, 8CB, 8DA, 8BV, 8DV, 8DY, 8EN, 8ER, 8EV, 8LX (C.W.), 8NG, 8EL, 8KZ, 8FW, 8NI, 8XK, 8XU, 8ZW, 8ZA, 8WY, 9AU, 9CI, 9CF, 9HR, 9ZL, 9ZN (very QSA), NSF.

3DK, BRYN ATHYN, PA., Oct. 1919 to Aug. 27, 1920.
1AD, 1AE, 1AS, 1AW, 1AZ, 1BAY, 1BBL, 1BM, 1CK, 1CM, 1CS, 1DA, 1DE, 1EK, 1EO, 1EP, 1FA, 1FQ, 1GA, 1HAA, 1JA, 1JQ, 1KT, 1PM, 1RE, 1RH, 1RM, 1RN, 1RU, 1RZ, 1SZ, 1TS, 1ZS, 2AIM, 2AR, 2BF, 2BH, 2BK, 2BM, 2CM, 2CQ, 2CS, 2CT, 2CY, 2DA, 2DF, 2DK, 2DM, 2DN, 2EL, 2ET, 2FI, 2GR, 2IF, 2IR, 2JE, 2JU, 2JZ, 2KM, 2ME, 2MK, 2NF, 2NM, 2NN, 2OA, 2OM, 2PL, 2QD, 2QR, 2RB, 2RH, 2RK, 2SH, 2TF, 2UE, 2VU, 2WB, 2WX, 2XB, 2XC, 2XH, 2XJ, 2XU, 2XX, 2XZ, 2YM, 2ZC, 2ZH, 2ZM, 2ZS, [illegible] V), 3AF, 3AIE, 3 AN, (3ANC), 3AO AV, 3AVY, 3AW, 3 3G, 3BH, 3BM, 3 3Y, 3BZ, 3CB, (3 CQ, (3CS), 3CV, DE, (3DF), (3DH S), (3DZ), 3EA,), (3EP), (3EV) K, 3FN, 3FO, 3F V), 3GX, 3HE, 3H), 3IM, 3IR, 3IS, E, 3KG, 3KM, 3LI IZ, 3NB, 3NU, 3NU B), 3PD, 3PG, 3PJ B, 3QC, 3QH, 3Q U, 3RX, 3SQ, 3T Z, 3XC, (3ZA), 3 G, 8AK, 8ALE, 8B Y, 8CB, 8CC, 8CH E, 8DO, 8DQ, 8DI R, 8ES, 8EZ, 8FI F, 8HP, 8HY, 8I C, 8MN, 8MT, 8I Y, 8XA, 8XK, Z, 9DM, 9EP,

8LX, CRAFTON, PA., Aug. 23 to Sept. 12.
1AW, 1FV. (1HAA), (1RZ), 1TS, 1TE, (2BK), (2JZ), 2LK, 2NF, 2RK, 2TF, 2TR, CT, 3EH, 3EN, 3GM, 3GN, 3GT, 3HJ, 3NC, 3NV, (3VV), 3VW, 3WZ, 4AL, (8BP), (8BV), 8CB, 8CF, 8DA, 8DI, A, 8ML, (8MT), (8WY), 8XP, 8ZW, 9AT, (9AU), 9HR, 9KF, 9OZ, 9ZJ.

A CITY, IOWA, Sept. 5 to Oct. 5.
CA, 4ED, 5AS, 5EB, 5HA, 5ZA, 5ZL, AAH, 9ABY, 9AEG, 9AEQ, 9AEZ, 9AJ, 9AK, 9AOC, 9AT, 9AU, 9BC, CS), 9DB, 9DT, 9EQ, (9EZ), 9FR, R, 9JU, (9KI), 9KV, 9LC, 9LG, 9LK, 9NU, (9NG), 9OE, 9PL, (9RX), 9SL, 9ZC 9ZH, 9ZJ, 9ZS, 9ZV, (9ZQ), nd Phone).

IC, DETROIT, on Sept. 26.
2FG, 2XG, 3DH, 3MU, 4FI, 8AFT, XK, 9AP, 9AU, 9HR, 9LC, 9ZN,

ZH, RICHFIELD, UTAH.
)H, 6EJ, 6ZG, 6AT, 6AK, 6BQ, 6AQ, PQ, 6IY, 6IF, 6JI, 6KP, 6JM, 6EJ, NI, 6UES, 6GI, 6BJ, 6GF, 6EA, 7IM.

-6EN, 6JT, 6KP, 6EA, 6HH, 6KA, GE, 6QR, 6AB, 6AAW, 6IP, 6FS, 6ER, 6EC, 6NE, 6JD, 6EJ, 6TX, 6IQ, 6AE, 6AAJ, 6AY, 6SK, 6SR, 6CE, 6AN, 6AM, 6MZ, 6CT, 6AIG, 6ABX, 6AC, 7CU, 6SK, 5ZC, 7CC, 9CE, 9AIG, 9EL, 7IM, 9PI, 9AEG, 9BI, 9AIR.

2WG, BRONX, May 1 to July 31.
1AD, 1AK, 1AS, 1AW, 1CC, 1CE, 1CK, 1CZ, 1DAY, 1DY, 1DZ, 1FB, 1FW, 1GM, 1HAA, 1HJ, 1LAO, 1MO, 1RZ, 1NF, 1TS, 1VA, (2ANN), (2JU), (2CE), (2EX), 2BG, (2DS), (2EL), (2JN), 2JT, (2JZ), (2ME), 2NF, 2RB, 2TF, 2UE, 2ZM, 3AW, 3EN, 3GB, 3GO, 3GV, 3HJ, 3NN, 3NV, 3SJ, 3VV, 3ZA, 8AT, 8BB, 8BKCW, 8BV, 8CW, 8DA, 8DV, 8DW, 8HR, 8LX, 8MT, 8NI, 8TH, 8ZY, 9HR, 9ZN, NSF.

(Concluded on page 58)

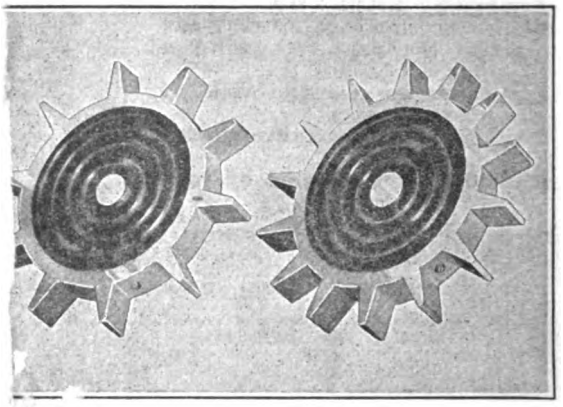
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KNOCK 'EM DEAD

The Benwood Rotary Disc

Something entirely new

A real disc suitable for any 1 K.W. installation



...shown with 8, 10 and 14 points or teeth.

Discs are of solid cast alumi... ing qualities and lightness Complete disc weighs little over half pound.

Dimensions:—Six inches in diameter, three quarter inch in thickness. End of teeth only 3-16 inch thick. Gives the quick break so much desired.

The rotor is light enough for the smallest motor and yet large enough for the highest powers. Used in conjunction with the BENWOOD stationary electrodes, a beautiful clear soft note is obtained that is easily distinguishable thru the heaviest of QRM.

PRICE - - $8.00

Specify size of motor shaft.

SPECIAL

BENWOOD stationary electrodes, consisting of highly polished knob bu... copper sparking point with round brass shaft, minus support, exactly as used on the famous BENWOOD gap,

$1.00 EACH, PREPAID ANYWHERE, QUANTITY LIMITED.

THE BENWOOD CO., INC., Co...

If you use a Benwood please send us y...

The B... see so...

I made ... QSA o... your B...

I use t... seen in ... night I ... in the ... tations ... VORK-

Every ... hearst ...

They ... BENW ... gap. ...

listen ... judge ...

SYH, ... BER, ... OKO, ... QIR, ... QET, ... 8TB, ...

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GET A BENWOOD

SE OVER AND THEN ORDER YOURS

St. Marys, Ohio

my opinion, the best gap on the market. You should ers I get concerning 8ER's signals.

Very respectfully yours,

Chas. Candler, 8ER.

Fall River, Mass.

Radio Station 1AK

1100 Miles, to Copeville, Tenn., where I was reported b and loose coupler hook-up, using a HALF KW with AP. This was due to the efficiency of the gap.

(Signed) Harold C. Bowen.

Danville, Va.

Radio Station, 3BZ

)D gap and find it superior to anything I have ever . 3BZ's spark speaks for the BENWOOD. Saturday)r two stations, in the 1st dist., 5 or 6 in the 2nd, two in the 9th, all within one hour. Not one of these n 300 miles of Danville. THIS IS NOT FREAK one most any night.

(Signed) W. T. Gravely.

an
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V,
K,
A,
P,
T,
K.

PRICE - - $30.00

Send your order for this apparatus to any of the following dealers or to us direct.

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Arno A. Kluge Co.
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Manhattan Electrical Supply Co.
Chicago, Ill. St. Louis, Mo.

Northwest Radio Service Co.
609 Fourth St.
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Western Radio Electric Co.
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F. D. Pitts & Co.
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The Radio Electric Co.
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Pittsburgh, Pa.

)th & Olive Sts., St. Louis, Mo.

etters. **Dealers, write for proposition.**

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3BZ, DANVILLE, VA., Sept. 15 to Oct. 1.
(1AE), (1AW), (1DW), (2BB), (2BK), 2BN, 2CE, (2CT), 2FG, (2GR), (2HN), 2JU, (2KT), (2ZL), 2RK, 2SH, (2WB), 2RV, (2JZ), 3BG, (3KM), 3HG, (3EN), 3GU, 3HJ, 3RW, 3DS, (3FG), 3EE, (3JK), 3HX, 3VV, (4YA), 4XB, 5XA, (5DA), 8DR, 8EE, 8NI, (8ACF), 8GB, 8NT, 8IK, (8RQ), (8EN), 8EV, (8FT), 8NZ, 8QM, 8CQ, 8HS, 8LD, 8HH, 8IB, (8DV), 8DZ, 8ZD, 8AJ, (8ZA), 9MK, 9GX, 9GK, 9QM, 9HR, (9KV), 9EQ, 9AAF.

5ZC, DALLAS, September.
(5AO), (5AI), (5IS), (5AP), (5CD), (5AL), (5CI), (5CG), (5DW), 5HA, 5FA, 5ZV, 5ZW, (5ZU), 8DA. C.W., 9AEG, (9LR), 9LG, 9EL, 9OE, 9XJ, Cataline Islands and Los Angeles Fone.

6EB, LOS ANGELES, August 15 to Sept. 21.
6AK, 6AN, 6AT, 6BJ, 6BN, 6BQ, 6BR, 6CC, 6CI, (6CO), 6DK, 6DO, 6DT, 6DY, (E6J), (6EP), 6EX, 6FE, (6FS), (6IY-Day-light), (6JI-Day-light), 6JN, 6JQ, 6JR, 6MZ-day-light, 6OH, (6QM), 6QR, 6QU, 6SR, 6UM, 6ZE, (7CU)—August.

6EX, BERKELEY, CALIF.
6AK, (6AJ), (6AV), 6BQ, 6CM, 6CQ, 6CS, 6CV, 6DH, (6DK), 6DP, (6EA), 6EB, 6EH, (6EJ), 6EM, 6EN, 6ER, (6FE), 6FI, 6FS, 6GH, 6GI, 6GM, 6GQ, 6HY, 6IF, (6IM), 6JD), (6JI), (6JM), (6JQ), (6KP), 6LQ, 6GR, 6MH, 6MZ, 6NS, (6OH), (6PQ), 6QR, 6RD, (6SK), 6TC, 6TX, 6UM, (6AAT), 6XZ, 7AN, 7CH, 7CR, (7BP), (7CU), (7CW), 7DK, 7DS, 7FH, 7YB, 7ZI.

CAN. 3FE, NAPANEE, ONT., September
On one V-24, Average Audibility 9:
1AW, 1BBL, 1CK C.W, 1CZ, 1EP, 1GY, 1HAA, 1NAQ, 1XD 'Phone, KQO 'Phone, 1XT, XFI, C.W., 2BB, 2BK, 2BM, 2GK, 2GR, 2JS, 2JU, 2JZ, 2NF, 2QV C. W., 2TF, 2WB, 2ZL, mod. C.W., 2ZM, 3ABB, 3BPC.W., 3BZ, 3DH, 3HX, NSFC.W., 8AAN, 8ACF, 8AEG, 8AGLC.W., 8AM, 8BV, 8CBC.W., 8CE, 8CQ, 8DAC.W. and 'phone, 8DI, 8DR, 8EV, 8EZ, 8FEM, 8FO, 8FV, 8FW, 8GS, 8HA, 8HF, 8HG, 8ID, 8JS, 8LF, 8NI, 8OI, 8RZ, 8SH, 8XCC.W., 8XK, mod. C.W. and 'phone, 8ZE, 8ZVC.W., 9DF, 9GK, 9HA, 9HR, 9KF, 9ZQ.

1HAA, MARION, MASS., Sept. 1st to 25t
(1AK), 1AS, 1AE, 1AG, 1AR, (1AW), (1A
(1BL), (1BBL), (1CK), (1CZ), (1CM), (
(1CBJ), 1CBX, (1CBC), (1DY), (1DQ), (
(1DU), (1EAV), (1ES), (1EBS), (1EP), (
(1FV), (1FD), (1GAO), 1GY, 1GAW,
(1HAX), (1HAL), (1IS), 1IAT, 1KAQ, 1
1KAW, 1LAV, (1NAQ), (1OAD), 1OJ, (
1PAW, (1QAV), 1QR, (1RV), (1RZ), (
(1SN), (1TS), 1VAY, (1VAE), (WAU), 1
(1XT), 1XD, (1XE), 2AEF, 2ARY, 2AVR, (2
(2AJW), (2BK), (2BG), (2BM), (2CT), (
2DF, (2GR), (2HN), 2IT, (2JU), (2JZ),
(2MP), (2OA), 2OE, 2OM, (2PL), (2PV),
(2RK), 2SH, (2TF), 2TS, (2VA), 3BG, 3BH,
8DL, 3DS, 8DL, (3EE), (3EH), (3GX),
(3HS), (3HG), 3KM, 3NB, 3PU, 3OB, 3PS, (
3UC, 4AO, 4CP, 5AZ, 7HH, 8AFS, 8ACF, 8
8AC, (8BV), 8CB, (8DV), (8DY), 8DR,
(8EN), 8FO, 8FT, 8HH, (8JS), 8LX, (8RQ),
(8XK), (8ZD), 8OY, 8OI, 9HM, 9HR, 9ZL, 9

Heard By S. D. Browning,
Aboard Lighthouse Tender "Madrono"
Using Galena.
Sept. 15 to 16 in Suisun (San Francisco) 6EB, 6ER, 6IY, 6JD, 6JI, 6JM, 6NM, 6PL, 6SK, 6TC, 6TX, 7CC, 7CU.

8BV, LOCKPORT, N. Y., Feb. 1 to Sept. 30.
(1AW), 1BT, 1DQ, (1HAA), 1IR, 1JR, (1NAZ), 1QPmod., 1XD phone, 2AP, 2ARD, (2BC), 2BG, 2BK, (2BM), 2CA, 2ES, 2HO, (TJU), (2JZ), 2LU, (2NF), 2OA 2OU, 2RK, (2RF), 2WB, 2ZM, 2ZL, (3BZ), 3DC, 3EH, (3HJ), 3LG, 3LO, (3NB), 8AAN, 8ACF, 8AM, 8BP, (8CB), 8CF, 8CV, 8DA, (8DI), 8DR (8DV), 8EL, (8ER), 8FT, 8HH, 8JS, 8LA, 8LF, 8LP, (8LX), (8MT), 8MZ, (8NI), 8OI, 8OJ, 8OZ, 8RZ, (8SI), 8IK, (8WY), 8XA, 8XK, 8XU, 8ZD, 8ZK, 8ZV, (8ZW), (8ZX), 9AD, 9AEZ, 9AT, 9AU, (9CE), 9ER, (9HM), (9HR), 9ID, 9OQ, 9TP, (9ZL), (9ZN), 9ZQ, (NSF).

G. S. HOLLY, CAMBRIDGE, MASS.,
Aug. 7 to Sept. 26.
1AW, 1HAA, 1KAY, 1NAQ, 2AMZ, 2BG, 2BK, 2DN, 2EL, 2JU, 2JZ, 2OM, 2RK, 2RV, 3BG, 3BZ, 3HG, 3HJ, 3NB, 3ZE, 3ZW, 8KE, 8LF, 8NI, 8OZ, 8QM, NSF.

6JM, SAN FERNANDO, CAL., Aug. 15 to Sept. 15.
(6AE), (6AG), (6AK), (6AN), (6AT), (6BJ), (6BN), (6BQ), (6BR), (6CC), (6CO), (6CP), (6DK), (6DP), (6EJ), (6EP), (6EX), (6FE), (6FS), 6FX, 6GF, 6GO, 6GR, 6II, (6IY), (6JI), (6JJ), 6JK, (6JN), 6JQ, (6KM), (6MZ), 6NO, (6OH), (6QM), (6QK), (6TC), (6AAT), 6AAW, 6AAX, 6AAZ, (6BAC), 7BP, (7CU), 9ZI.

4BE, WILMINIGTON, N. C., Sept. 20.
8DJ, 1AW, 8EN, 2ZL, 8ZOW, 1XOF, 8ACF, 3KM, 8RW, 8NI, 4BZ, 3FG, 4AE, 5DA. Sept. 22: 8RQ, 8XK. Sept. 24: 9ZJ, 8ACF, 8RQ, 9ZV, 9EQ, 9AP, 2RK.

9CS, CLINTON, IA.
5CD, 8DI, (8FT), 8GD, 8TA, 8ZR, 9AL, 9AT, 9BC, 9BY, on radiophone, 9BY, (9CA), 9DC, 9EE, 9EL, 9EQ, 9EZ, 9FG, (9GC), 9HR, (9IA), (9IX), 9JL, (9KV), 9KY, (9LC), (9LU), 9MH, (9MS), 9NC, (9NQ), 9OR, 9QI, 9QQ, 9UU, 9WQ, 9YO, 9ZJ, 9ZN, 9AAV, 9ABZ, 9AEG, (9AEQ), 9AEU, 9AEF, 9ACL, 9ANV.

8DA, SALEM, OHIO, May 1 to Sept. 22.
(1AW), (1HAA), 1TS, 1XD-voice, 2BK, 2BF-C.W., 2CE, 2CT, 2EL, 2GR, 2JE, (2JZ), 2JU, (2NF), (2RK), (2TF), 2ZM-C.W., 2ZL-C.W., 3AAP, 3BZ, 3CG, 3EN, 3GX, (3HJ), 3KM, (3NB), 3PS, 3ZA, (3ZS), 4BB, 4BZ, 4CC, 4YA, 5DA, 8BP, 8OJ, 8BO, (8DI), 9ALS, 9GS, 9HM, 9HR, 9JN, 9KV, 9MH, 9ZI, 9ZN, (NSF), KQO-voice, (KBN-2500 miles).

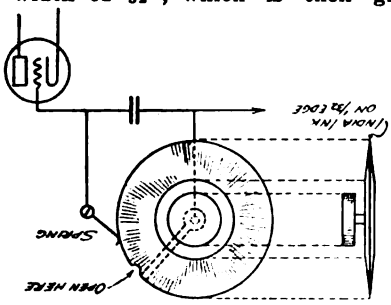
4BV, WOODS HOLE, MASS., August.
(1HAA), 1AW, (1EAV), 1BJ, (1AWU), 1WE, 8CE, 2XG, 3PB, 3ZS. Heard on board U.S.S. ACUSHNET during August: 1 AW, 1HAA, 1KT, 4CC, 5ZA, Vessel off Sandy Hook, N. Y.

T. G. BORIGHT, SUTTON, QUE., Aug. 29-31.
1AW, 1BK, 1EZ, 1FT, 1FV, 1HAA (QSA), 1RV, 1SA (fone), 1XB (fone), 2AJ, 2AK, 2BK (QSA), 2BM, 2BV, 2DN, 2EL, 2EP, 2JZ, 2NF, 2TF, 3CT, 3KM, 3VV, 3WV, 8DE, 8EN.

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A ROTARY VARIABLE GRID LEAK

This handy device is made from a 2" disc of ⅛" fibre. A double bevel ½" wide is put on each side, reducing the edge to a width of 1/32", which is then given



several coats of India ink. The small place cut out in the rim is left uncoated, to open the circuit, and contact with one end of the coating is made by a narrow copper or foil strip. The disc is then mounted on the panel and a light spring arranged to make contact with the rim as it revolves.

—Contributed by C. L. Norman.

STRAIGHT C.W.

(Concluded from page 26)

and body. Swinging antennas may be a problem, but we can beat that too.

As proof that the time for the change is here, shoot around some night with the bulb oscillating and listen to the fellows who are already there, working on schedules of their own. In Connecticut we hear several 2's and a flock of 8's on straight C.W. and several of them we know are using but a few watts. You men with I.C.W.—ask somebody to listen while you change over to the pure undamped, and their report will make a believer out of you for life.

We have extolled the virtues of tube transmission. Now let's change it over to straight C.W., fellows, adapt our receivers to it, and reap the benefits that this system offers us—it is childish to spoil good C.W. by modulating it, but we must get the receivers to heterodyning if we are to move traffic. How goes it?

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of QST published monthly at Hartford, Conn. for October 1, 1920, State of Connecticut, County of Hartford.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Radio Relay League, Inc., Hartford, Conn.; Editor, Kenneth B. Warner, Hartford, Conn.; Managing Editor, (none); Business Manager, Kenneth B. Warner, Hartford, Conn.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its names and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) The American Radio Relay League, Inc., an association without capital stock, incorporated under the laws of the State of Connecticut.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) Hiram Percy Maxim, Hartford, Conn.; John S. Dunham, Brooklyn, N. Y.; C. D. Tuska, Hartford, Conn.; W. S. Browne, Brooklyn, N. Y.; C. R. Runyon, Jr., Yonkers, N. Y.; Nicholas Roper, Youngstown, Ohio; Chas. C. Godfrey, Bridgeport, Conn.; Frank Conrad, Pittsburgh, Pa.; F. M. Bookwalter, Springfield, Ohio; Chas. A. Service, Jr., Bala, Pa.; Miller Reese Hutchison, New York City; George M. Woodcock, Buffalo, N. Y.; C. Tefft Hewitt, Swissvale, Pa.; Leonard D. Fisk, West Hartford, Conn.; H. E. Rawson, Chicago, Ills.; Emma Candler, St. Marys, Ohio; Chapman Printing Co., Hartford, Conn.; Robert F. Gowen, New York City; E. C. Wilcox, Meriden, Conn.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceeding the date shown above is..... (This information is required from daily publications only.)

K. B. Warner

Sworn to and subscribed before me this 13th day of October, 1920.

F. L. Pratt, Notary Public

(My commission expires February 1, 1924.)

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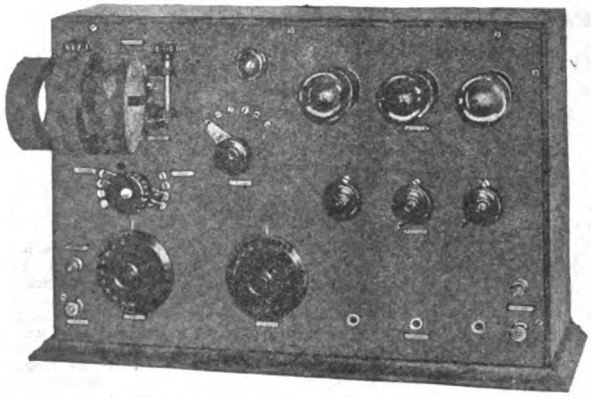
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Transatlantic Sending Tests

HAVE you heard about the Transatlantic Sending tests which will be conducted this winter by EVERYDAY ENGINEERING? These tests, to be made with the most completely equipped English experimental stations, will start on February 1st, 1921.

YOU have plenty of time to get your station ready for the contest. The first announcement of the Tests appeared in the September 1920 issue. Send for it if you missed it. Rules and the schedule system were given in the October number.

PRIZES which will be given by various manufacturers and individuals will be announced in November, and other details in the subsequent issues.

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THE OFFICIAL ORGAN OF THE A.R.R.L.

QST

DECEMBER, 1920

VOLUME IV No. 5

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QST
A Magazine Devoted Exclusively to Amateur Radio

Dangerous Legislation Confronts Us

THERE is at present lying inactive in the Senate Committee on Naval Affairs a bill introduced on March 8th last by Senator Poindexter, of the state of Washington, which is known as S-4038, and which represents another attempt at radio legislation on the part of the Navy Department. More than a year ago the Radio Sub-Committee of this committee held a hearing on the subject of a new radio bill, and at these hearings Messrs. F. H. Schnell, R. H. G. Mathews, C. D. Tuska, and K. B. Warner were present, as representatives of the A.R.R.L., on instructions from our Board of Direction. As the bill began to take shape, it was apparent that it was wholly un-American in many of its provisions and would provide us amateurs no assurance of continued operation. Our representatives, under instructions from our Board of Direction, got a hearing and formally protested against the iniquitous provisions of the bill, as did many of the commercial interests and others. Slight revisions in the bill were made as a result of the later hearings, but in its main provisions it was not changed at all. It has now been read twice in Committee and is ready for report.

In view of the fact that the International Communications Conference was to meet in Washington in October, and as the Poindexter Bill if passed would probably soon become obsolete by the action of this conference and the action of the next International Convention, and as the general sentiment seemed to be against the passage of the bill until the final radio policy was fixed by a new international convention, the Board of Direction of the A.R.R.L. were of the opinion that the Poindexter bill did not present a danger of such nature as would call for action on the part of the membership. That the provisions of this bill were iniquitous they were well aware, and on several occasions they were on the verge of bringing the matter before the membership, but refrained from any ill-timed action until such time as in their judgment the real danger might become more apparent. It has been thought that the Poindexter bill would die a natural and well-deserved death, but recently there has sprung up throughout the country an undercurrent of fear that the bill is about to be revived and put through with a rush during the short session of Congress which begins December 6th. Accordingly, Mr. Charles H. Stewart, our legislative representative, has again been in Washington, but he has not been able to unearth any tangible evidence of a plan to get action on the bill soon. We find that Navy men are quoted as saying the bill will go thru at this next session, and that many people who come into semi-official contact with radio matters are of the belief that the possibility exists of its being taken up then. Well we know that on its merits this bill can never become, law for it is un-American to the core, and the only way it could ever happen is that it be "railroaded" thru. There is the bare possibility that the advocates of this bill, knowing its hopelessness in a fair trial, have been lying low and greasing the way for getting quick action on it as soon as Congress opens. To the extent that this possibility can exist, the bill is a grave danger to us amateurs, and we feel that the time has come for us to get into action on it ourselves.

The Poindexter bill provides for the existence of eight classes of stations, and the several kinds of amateur stations are included. However, it does not in itself contain any technical regulations whatever regarding wave lengths, decrement, power, etc., as does the present law, but instead it provides for the formation of a "National Radio Commission" which shall be given authority to formulate and promulgate regulations for the operation of all classes of stations, and to change these regulations as they see fit—in fact, the bill reads that this Commission "shall have full power to regulate radio communication in the United States". It makes no provisions for hearing the claims of

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interested classes of stations, and thruout is amazingly autocratic and contrary to the principles of American government. This will be understood when it is said that the bill, in the main, was got up by Naval officers who were abroad during the war and there acquired the "imperialistic" views of Europe on matters affecting communication. The Commission provided for in this bill would be composed of representatives from the Navy, War, Commerce, and Post Office Departments, but it also provides that the Secretary of the Commission shall be a Navy officer of the line, appointed by the Secretary of the Navy, thereby giving practical control of the Commission to the Navy Department. Thus at once it will be seen how militaristic this control can be. The Commission is further empowered to refuse a license to a station not already established at the time of the passage of the Act if the proposed station will interfere with the operation of existing stations or if such station "is not necessary for the good of the general public service." As the bill reads, this applies to amateur stations, without question. This grant of power is capable of being made the means of effectually preventing the entry of the generation now growing up into the privileges which we ourselves now enjoy as American citizens.

There are countless other objections to the bill, but just consider any of the above features. Such a Commission as provided for, controlled by the Navy and cherishing imperialistic and undemocratic ideas, could not be expected to be anything but hostile towards the amateur. In the twinkling of an eye they might announce that the amateur wave length should be two meters, the power one watt, the decrement .0001. They would be perfectly within their "rights", and we would have not one satisfactory avenue of appeal. The next day they might change our wave length to 200,000 meters and make all our "two meter" equipment worthless (—for we have no doubt that some of us would devise means for "reaching out" somewhere on even one watt!)

The un-American qualities of this bill reach a state of absolutely unqualified despotism. Probably no legislation was ever proposed in our country which would delegate such autocratic powers to a group of men. This National Radio Commission would have complete power over all classes of radio in this country, would be empowered to make any regulations that met its fancy, and none of the classes of citizen stations would have the opportunity of being heard on its own behalf. We fought the Revolutionary War for just that principle. By this proposed bill, amateur radio could be wiped off the map over night. This is a democratic country and we Americans expect to have laws that give us full and free hearings of our side of the story on all matters that affect our welfare. This bill does not give us a single guarantee of justice.

Such is the Poindexter Bill, S-4038. Now, fellows, let's get this bill definitely out of the way, whether or not an attempt is going to be made to railroad it thru this Congress. We want you to immediately write your Senators and Representatives telling them what this bill would do to you if passed, pointing out its brazenly autocratic provisions, and requesting them to vote against it in case it comes up for passage and to use their influence in every possible way against it. The following suggestion for a letter contains the facts that you should get before your Senator.

Senator ————————
Senate Office Building,
Washington, D. C.

Dear Sir:

Your attention is respectfully drawn to a very serious situation which confronts every American citizen interested in Amateur Wireless, and on which I, as one of your constituents, desire to be heard.

I refer to Senate Bill 4038, known as the Poindexter Bill. This bill gives into the hands of a Commission absolutely despotic power. It would enable this Commission to impose regulations which would banish Amateur Radio at a stroke of the pen, and all of this without the opportunity of being heard. The bill seems to entirely forget that it is utterly un-American to attempt to pass laws and regulations without giving the citizens an opportunity to be heard on their own behalf. It seems to forget that we amateurs number over 250,000 and that we spend upwards of five million dollars per year in the purchase of our equipment, and it would place our entire future as Radio Amateurs where we would have not one guarantee of our continued right to continue the pursuit of amateur wireless as American citizens, and would give us not one single chance to be heard on the matter ourselves.

I respectfully request that you vote against this bill if it comes up for passage, and that you use your influence in every possible way against it.

Yours truly,
(Signed).....

Do not leave this for the other fellow to do. Remember that it is only by each amateur making it his personal duty to write that the members of Congress may be informed of our opinion of the bill. The officers of the A.R.R.L. of course will

(Concluded on page 12)

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Self-Rectifying C. W. Sets

WITHIN the past few months practical information has come to light on an entirely new idea in tube operation—their use on alternating current of whatever frequency is available, without rectifiers and without costly motor-generators, any desired voltage being obtained simply by stepping up with a transformer. This method still has its defects, and they are not inconsiderable, but QST feels that it definitely meets the motor-generator question and that the use of a.c. on the plates will promptly supersede the generator except in telephony and special cases. This is of the highest importance in the future of amateur C.W.—it removes the greatest single expense and will do much to popularize experimenting in this field.

There are two cases to be considered in the use of a.c.—the use of one half of the cycle (which is the case when but one oscillator is used), or the employment of both halves of the cycle (which requires double the number of oscillators).

I.C.W. with One Half of the Cycle

Station 8XK, as described in detail in QST for September, illustrates the first case, in which an audio current is impressed on the plate. The idea is shown in Fig. 1 This is not 8XK's oscillating circuit, instead being the Colpitts (which seems unquestionably the best circuit for all-around amateur work), but it conveys the idea. Imagine A to be a 500 cycle alternator, or even a source of 60-cycle current. The voltage is stepped up to whatever value is needed, by the transformer T. During the half cycle that the plate is positive, the amplitude of the output current is roughly proportional to the voltage, and it is zero for the succeeding

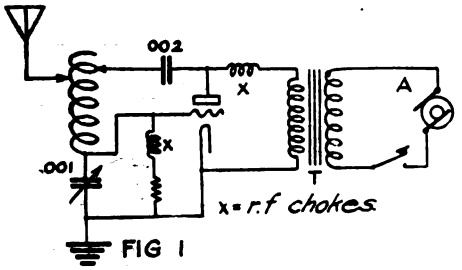


FIG 1

half cycle because of the valve action of the tube. It is herein that it does it own rectifying. Thus we have theoretically approximately sinusoidal modulation of the output, with the zero value obtaining during the half cycles that the plate is negative.

This idea is discussed at length and in practical fashion by Lewis M. Hull in the Bureau of Standards Scientific Paper No. 381, entitled "An Electron Tube Transmitter of Completely Modulated Waves." We would advise every interested amateur to obtain a copy of this paper, which may be done by sending five cents (no stamps) to the Superintendent of Documents, Government Printing Office, Washington. Mr. Hull describes such a set built at the Bureau, using one 250 watt P tube and a 500-cycle alternator. The Meissner circuit was chosen, with parallel power supply, and the filaments are also heated from the alternator supply. The construction of the set is described, but as it exceeds in power and wave lengths the sets we amateurs are interested in, it merely serves to give us an idea. However, some extremely valuable transmission and reception data for this kind of a transmitter are given. The general efficiency compares favorably with operation from a d.c. source. Being completely modulated, reception is possible with a non-oscillating detector, of course, and if such reception is desired the use of one side of the cycle as herein described will be found much superior to the use of both halves (as described below). The startling feature, however, is that by comparison with heterodyne reception this type of emission is not at all well suited to non-oscillating reception. With 5 amperes in a 50 foot aerial, signals with an audibility of 10,000 were received at 100 miles with an **autodyne** receptor and two-step amplifier, while the modulated note was received only over a limited range. It is true that the heterodyned note is not the clear flute-like note of straight CW, being rather "mushy", but is not at all bad, improves the signal-stray ratio, and very greatly increases the working range. Quoting this paper, on short waves "the voltage induced in a receiving antenna by a logarithmically modulated wave" (such as a spark set produces) "will give a response on the output side of the detector greater than that induced by a sinusoidally modulated wave train radiated from antennas in which the RMS antenna current is the same." The reason will be apparent by an inspection of Fig. 2 upon which are plotted **to the same scale** the envelopes of spark and sinusoidally modulated CW trains of the same antenna current and both operating at 500 cycles. Altho the logarithmically modulated train persists only about one twelfth as long as the sinusoidally modulated train, it rises to a peak value 13 times as great, which would undoubtedly

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result in higher instantaneous values of voltage on the telephones in the case of the spark transmitter, as it is the **rate** at which energy is applied to the phone diaphragms that determines the response. Incidentally, this bears out the statements

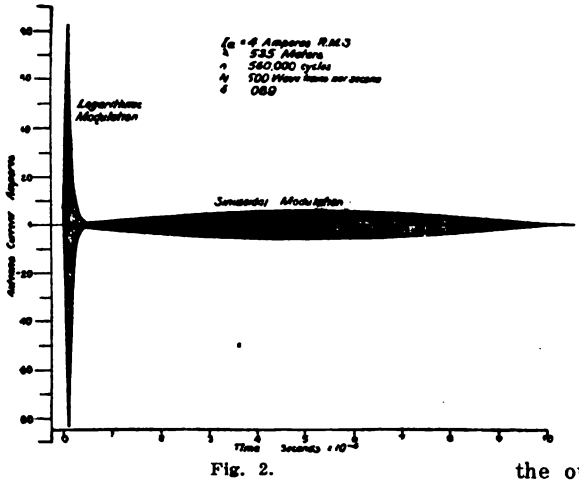


Fig. 2.

made in these colums by Mr. M. B. West anent the importance of adjusting the transmitter to a critical antenna voltage. We again point out, however, that such a sinusoidally modulated emission is well adapted for heterodyne reception and we repeat the statement in our November editorial that it is straight CW and not ICW to which we must now turn our attention.

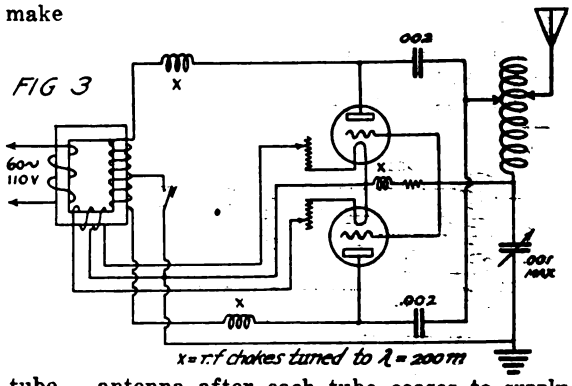
Both Halves of the Cycle

It will immediately occur to the reader that the use of another tube will make possible the utilization of the other half of the cycle and so double the output and greatly improve the characteristics for heterodyne reception. It will also double the note for audio reception, giving a 60 cycle note from 60 cycle supply whereas one tube alone will give but a 30 cycle note. If one is interested in modulated transmission the actual non-oscillating reception however, will be much more effective when but one tube is used, because the time interval between trains is not sufficient for the accumulated charge to leak off the grid even with but one tube, while in using both halves of the cycle the emitted energy is never quite modulated to a zero value. Such a 30 cycle note is not at all bad, being surprisingly staccato and never mushy in the least. The field for us amateurs, however, is in the use of both halves of the cycle and heterodyning it at the receiver.

All that is needed is a transformer having two secondaries, one for the high voltage for the plates and one of low voltage for lighting the filaments. The electrical dimensions will be governed by the voltages and currents necessary for the tubes used. For example, if a CW transformer of the type designed for use with rectifying tubes and a filter is available, it may be employed direct.

The two-tube circuit is shown in Fig. 3, where again the Editor presents the Colpitts circuit in the belief that it is better suited to 200 meter work on average aerials than any of the other circuits. This self-rectification scheme, however, can be used on any type of circuit and may be adapted to any arrangements of oscillating circuits that the experimenter may already have in operation. For example, Fig. 4 shows its use on the Hartley circuit, in which inductances L and L_1 may be helices or, to advantage, the outgrown spark set's pancake oscillation transformer, as in Fig. 5. It must be of low r.f. resistance and connected so the current flows in the same direction in both coils. The pancake O.T. if hinged will be very convenient in adjusting coupling. If considered too bulky, L may be a tube wound with No. 12 or larger wire, and L_1 a small tube revolving inside L and wound with about No. 28.

The circuit is really very simple and will be understood promptly. The tubes alternate in oscillating. Because a wave train will persist with the damping of the



antenna after each tube ceases to supply power to the antenna, the emission is continuous and never reaches zero by any means, so that for transmission to a non-oscillating detector one half of the cycle should be made blank. Using both and heterodyning, the note is "double", the 120 cycles still riding thru on the heterodyne, but not in displeasing fashion.

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The condensers are merely for insulating and any capacity around .002 will serve, such as a Murdock moulded section or a homemade glass plate condenser. It should be able to withstand about 5000 volts. The chokes should be carefully made to have a low distributed capacity, and spaced turns of wire just sufficiently heavy to

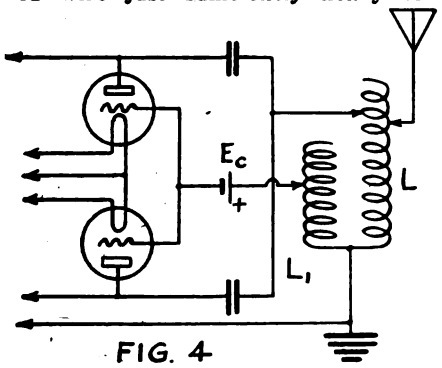


FIG. 4

carry the plate current, wound on an open frame instead of a tube, is suggested. The key is here shown in the h.t. lead, and so must be well insulated. If in the l.t supply it would interrupt the filament current also, which is unsatisfactory, but it may be so placed if a separate small transformer is used for the filaments. Or the key may be placed in the grid leak circuit. Both filament and h.t. windings are center-tapped so the circuit may be balanced, as with the old rectifying transformers.

For musical ICW we see no reason why this type of emission could not be chopped with a buzzer as we now do d.c.-operated sets. The abrupt break of the buzzer will give much better telephone response than modulated approaching the sinusoidal. It should also be possible to rig up two induction coils with good vibrators and a proper secondary voltage, each operating on 60 cycles thru step-down "toy" transformers. Two such coils are necessary because, it must be remembered, when the 60 cycle current reverses so will the apparently positive terminal of the induction coil secondary reverse. The potential should be all that the tubes will stand without breaking down, as it will be applied but a very short interval of time and so will not overheat. This seems the best possibility for obtaining a modulation envelope approaching the logarithmically damped spark envelope.

A 500-watt C.W. Transformer

The following specifications will serve as a guide for the construction of a transformer which will be sufficiently flexible to meet most experimental needs for a set of the type described, and will easily take care of as many as five 5-watt tubes on each side of the circuit.

General: A rectangular core carries three windings: a primary, a high voltage secondary, and a secondary for lighting the filaments.

Core: 1⅝" square cross section, of 29 ga. silicon steel, two legs 5.5" long, two legs 5 25" long, interlaced at corners. Wound ⅛" thick with Empire cloth or

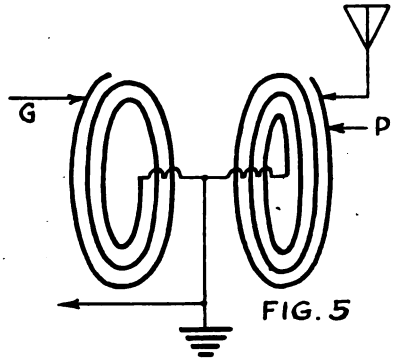


FIG. 5

Craft paper for winding insulation. Space figured for ⅛" fibre heads for all windings.

Primary: On one long leg, 268 turns of No. 15 D.C.C. wire, in 4⅓ layers of 62 turns each. This requires 360 ft., or 3.5 lbs. of wire. Designed for 60 cycle 110 volt input.

Filament Secondary: On one short leg, 38 turns of No. 11 D.C.C. wire, with center tap at 19th turn; in two layers of 19 turns each. Requires 25 ft. or 1.25 lbs. of wire. Each side of this winding is capable of delivering 12 amperes at 8 volts.

High Tension Secondary: On the second long leg, a total of 3046 turns of No. 24 enamel-covered wire in 18 layers of 170 turns each, with .003" paper between layers. Requires 2.75 lbs., or 2300 feet, of wire. Taps are brought out from the 351st, 703d, 1523d, 2343d, and 2695th turn. This secondary will deliver 650 volts between the center tap at the 1523d turn and each outside terminal; between the 1523d turn and the 351st and 2695th turn, 500 volts; between the 1523d turn and the 703d and 2343d turn, 350 volts;

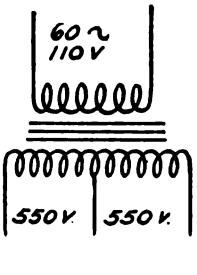


Fig. 6.

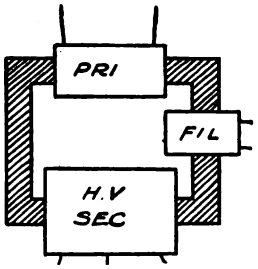


Fig. 7.

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giving it output values suitable for almost any amateur purpose.

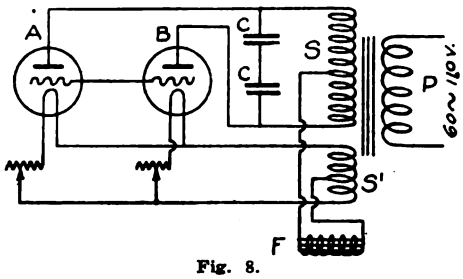


Fig. 8.

An A. C. Radiophone

Mr. J. G. Ruckelshaus, 2GF, Newark, N. J., very kindly describes to us experimental work he has done in this line resulting in a successful radio phone operating on a.c. without rectifiers, the high voltage being obtained from a step-up transformer as in Fig. 6. The arrangement of the windings is shown in Fig. 7: on a laminated core with a cross section of 17 sq. cms., wind 300 turns of No. 18 enameled wire for the primary; the secondary consists of 2400 turns of No. 32 d.c.c. with a tap at the 1200th turn; and the filament winding, on a short leg, has 22 turns of No. 14 enameled wire.

The high and low voltage circuits of the phone are shown in Fig. 8, where each end of the secondary goes to a plate, the center tap being connected to the center tap of the filament winding S' thru a choke coil M, of from 4 to 10 henries. With condensers C,C of 2 mfds., choke F is intended to form a filter for reducing the 60 cycle hum. The center taps of the two secondary windings serve as negative terminals, while the ends of both are alternately positive.

The complete circuit is shown in Fig. 9, and details of the inductances in Fig. 10. The circuit is the Meissner, and will be readily understood. The tube form is 3 inches diam. by 4½ inches long. The antenna winding consists of 10 turns of No. 18 D.C.C. wire, then a ¾ inch space, then 30 additional turns, the second part of the winding being tapped every fifth turn for wave length control. Over the 10-turn end a sheet of mica is rolled, and on this is wound the plate inductance of 40 turns of No. 24 S.C.C. In Fig. 10 the space between the windings and the mica has been purposely exaggerated. The grid coil has 50 turns of No. 24 S.C.C. on a 2-inch tube mounted to rotate in the space between the two sections of the aerial inductance.

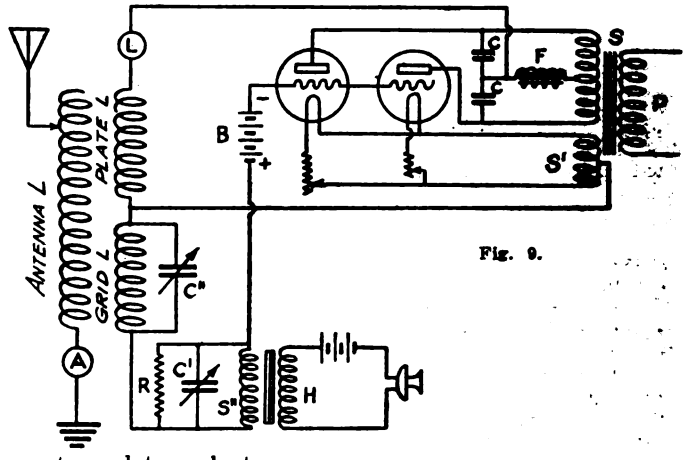


Fig. 9.

Grid leak modulation is used, with a home-made modulation transformer whose primary consists of 4 layers of No. 24 D.C.C. wire on the core of a ½ inch spark coil, the secondary consisting of the regular secondary of the coil. C'' tunes

(Concluded on page 22)

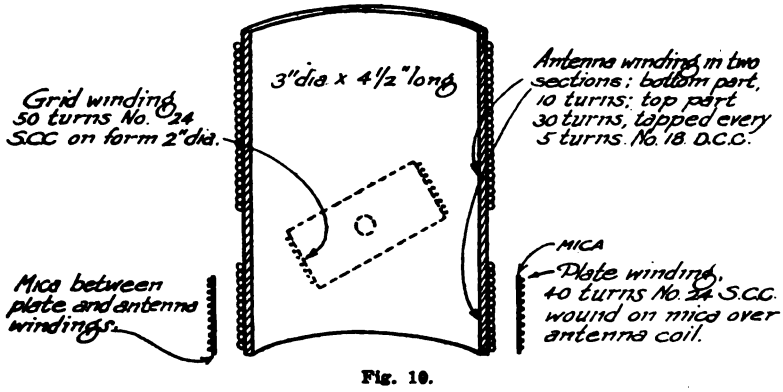


Fig. 10.

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Rotten Epistles

By The Old Man

Just as we suspected, this Young Squirt stuff got a rise from the old gent. Here it is—for us to laugh over. "Gawdnose" what T.O.M. will say when we publish a third Young Squirt story we have just received!—Editor.

IF it was not for everybody having their sense blunted by a presidential political row the Young Squirt's remarks about me would be considered just cause for a duel or a suit for libel or a dose of castor oil. The young rascal called me a "Beezlebub" or something about as musical. Now if there is one thing I am not, it is a "Beezlebub." I am not quite sure I know what one is but I am more than sure I am not one. I may have been guilty of many dreadful things in my long and exciting past but I'll be dogwallowed if I ever did anything that justified being classed with the beezlebubs. If I ever get over east again I intend to look in at the QST factory and get the address of "The Young Squirt." When I have it down in my note book along with the other crazy hook-ups I will bide my time and when our paths cross the amateurs of the First and Second Districts, respectively, will know that something is doing in the air.

And by heck he called me "Old Beeswax". He imputed that I have melted and run. Now I may get heated up at some of the things that occur in amateur radio, and at the Radio Club the other night I got good and hot, but so help me Bob I never melted. The last time I remember melting was in the dim and distant past when I fell out of a canoe and lost a .22 calibre rifle I had borrowed from my father without his consent. I was young and I melted on that occasion, but by golly I didn't run. That is one thing your Uncle Dudley will not do unless it is to chase Young Squirts back into their holes. (I reckon that ought to hold the kid for a while, what?)

You know I think this political campaign business has got into people's blood. The Republicans spend hours thinking up names and things to call the Democrats and the Democrats sit up nights thinking up damaging remarks to hurl back, and we read them every day until we think things tame and slow when somebody is not calling somebody else a liar and a crook. If somebody is not lambasting the daylights out of somebody else's reputation, the story is dull and belongs in St. Nicholas. What in blazes "The Young Squirt" wants to pick on me for can be explained in no other way. As I have repeatedly affirmed upon many occasions, I am not a humorist. I am a reformer. I was sent here by an all-wise Providence to reform amateur radio, to preach tolerance, peace on earth and good will to men who do not cause QRM nor burn up the town's electric light station. I have been doing it for several moons. Who can say I have not pointed out many rotten things, including "The Young Squirt's" sense of humor? Who shall say me nay that amateur radio is not less rotten because of my having been born among you? Just think how rotten it would have been if I had not brought my estimable and gentle, not to say genteel, influence to bear upon the young and growing art. I have spoken always in moderation and with elegance. I never have hinted at violence—oh no—and no Sunday School Radio Club could carry on its duties without following the Christian precepts I have laid down from time to time. Why, for gawdsake, I never had a halo beats me, but so far nothing like one seems to be coming by insured parcel post with my name on it. All of which may go to explain the blood curdling yell that caused the little wife to slip off the rocking chair onto the floor, and the cat to adjourn to the woodshed, when I finished reading this last "Epistle to The Old Man" by the Young Squirt.

Every thing in amateur radio may not be rotten. I may be laboring under a prejudice at this time on account of the outcome of the presidential election, and my four months' hard labor trying to make a C.W. set work. I can imagine, in spite of these and several other things, that there may be one or two things that are fine in amateur radio. Mr. Schnell writes me lately from his new job in Hartford that he has noticed one or two details not entirely rotten up his way. Just the same, nobody has ever included among these fine, edifying and uplifting samples anything connected with radio humor. Of all the broken down specimens of humor I have ever seen the selections garnered from radio literature have the distinction of taking the rag off the bush. There was one poor idiot out here in the middle west in bygone years who wrote an article entitled "Liars". About nine inches down from the top, I came near cracking a smile in that article, and I have always thought it came the nearest to being funny of anything I ever read in radio print. Old Amateur No. 1, Vermilya, made a stab at being funny some years ago, and I suspect Kruse intended to be comic on

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several occasions, but thought better of it. Several others have made a pass at the comedian stuff, but most of it has come out sob stuff instead. One poor misguided gink wrote me a letter once insinuating that one of my stories had been considered humorous by him. I knew it was not, but I thought I might be mistaken, and so I looked him up in Bradstreet's. It turned out that he had a job in a funny factory, and had no rating, and so I know I was right after all. It would be a terrible blow to think that all the good advice I had passed out to the young during my time should be considered as humorous.

I suppose "The Young Squirt" thinks his bundle of bunk aimed my way is humorous. He should have seen the saddened face and the glassy eye of one of the chaps at the Radio Club a while ago, who was reading the "Second Epistle". When he finished he hove a heavy sigh, and I thought he was going to burst into tears. One of my own yarns was read in my presence by one of my friends who little suspects who THE OLD MAN really is, and I thought he was going to have a bad case of the blues. He seemed to be terribly depressed, and that particular yarn was intended to be light and airy.

Warner's "Strays" in QST are an example of a fine manly effort to keep amateur radio humor out of the undertaker or mortuary parlor class. Sometimes you can see Warner thinks he has been funny. But I watched a man read "Strays" the other day. He sat in stony silence during the entire operation. He never batted an eyelash, and the corners of his mouth never suggested the flicker of a passing smile, even of audibility 2. There was one "stray" about Mrs. 8ER that I thought verged on being funny. But ND. It was because I knew Mrs. 8ER that I had a suspicion about the funny business. He did not know her, and it looked to him about as funny as a grocery advertisement.

The Chicago fellows get out a little sheet which they call "Grid Leak". It is not entirely sad, but in spots it makes you chirk up and look to see if the sun is shining. But it is written all over the sheet in letters a foot high that somebody thinks something in the outfit is funny. I showed mine to the president of our Radio Club the other night, and he read it through, and returning it to me, very seriously remarked that it was "quite informative". Can you beat that, much?

Before I get through with my C.W. experimenting, I think I may have the ground work of something that might be construed by a drunken person as being humorous. I shall attempt to make it a classic. I have already certain details which I confidently expect will produce lockjaw in any one outside the radio fraternity. I shall arrange them in cascade, and if the effect of the whole is not considered humorous enough to draw a smile from the cast iron face of our radio club president, I shall take a crack at religious literature. After all, I wonder of that is not where "The Young Squirt", "VN", "The Old Man", Wolfe, Kruse and some of the rest of us belong.

T.O.M.

DANGEROUS LEGISLATION

(Concluded from page 6)

not be idle, but it is essential that we have your support to the limit. DON'T DELAY —WRITE TODAY!

Note. The membership of the Senate Committee on Naval Affairs, their states, and their political affiliations, are given below. The membership of the Sub-Committee on Radio, which at this writing has the actual bill in charge, is denoted by asterisks. Amateurs in these states thus can know that they are addressing the Senators directly connected with the matter, and can write their letters accordingly. If you don't know who your Senators or Representatives are, ask your post-master.

Republicans	
Carroll S. Page	Vermont
Boies Penrose	Penna.
Henry Cabot Lodge	Mass.
*Miles Poindexter	Washington
Frederick Hale	Maine
L. Heisler Ball	Delaware
*Medill McCormick	Illinois
*Truman H. Newberry	Michigan
Henry W. Keyes	New Hamp.
Democrats	
*Claude A. Swanson	Virginia
John Walter Smith	Maryland
James D. Phelan	California
Key Pittman	Nevada
Thomas J. Walsh	Montana
*Peter G. Gerry	Rhode Id.
Park Trammell	Florida
Wm. H. King	Utah



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The Bureau of Standards---A.R.R.L. Tests of Short Wave Radio Signal Fading

By S. Kruse

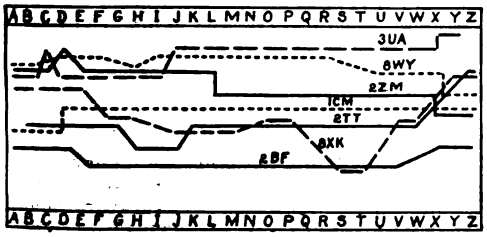
Assistant Electrical Engineer, Bureau of Standards

Presented at meeting of the Radio Club of America, Columbia University, September 24, 1920

PART II.

Results of Tests.

The test system began operations June 1, 1920. The results here given are, with few exceptions, those obtained on the test sheets of the last four weeks of the run, that is to say, from June 15 to July 17. The first three weeks of the test were run while winter conditions were gradually changing to summer ones and before the system had gotten properly under way. As three other tests are to be run during the other seasons it was thought best to consider the last part of this test which was run in summer weather. The additional information which could have been obtained from analysis of the first three weeks of the test would not at all have compensated for the additional men and labor involved. The results of transmission by station 9LC at St. Louis, Mo., were also eliminated as only a few records of any value were obtained. As has been explained, station 8ER at St.



Transmission by 9ZN July 8, 1920

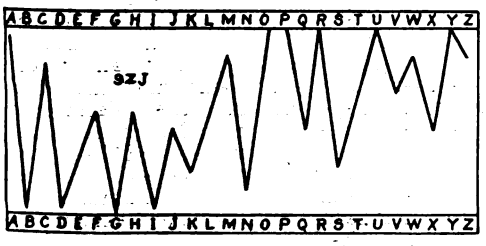
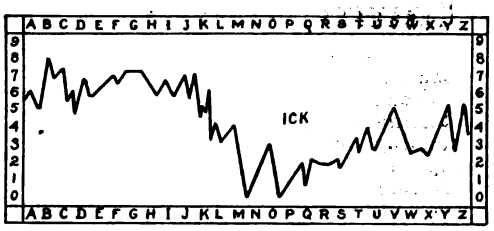


Fig. 12—Normal 9ZN curves.

Marys, Ohio, was added to the transmission system and the records on this station are considered instead of those on 9LC.

During the entire first week, the curves that were received seemed to mean nothing. In Fig. 12 are shown representative curves for station 9ZN. Those in the upper half of the sheet which were secured



Transmission by 8XK – July 6, 1920.

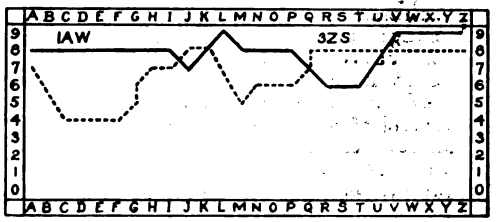
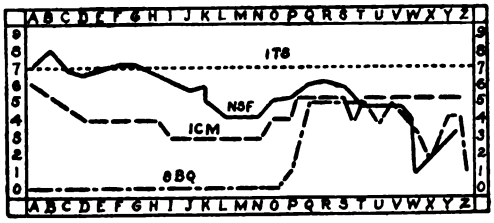


Fig. 13—Normal 8XK curves.

by 3UA at Baltimore; 8WY at Cambridge Springs, Pa.; 2ZM at Clifton, N. J.; 1CM at Laconia, N. H.; 2TT at Yonkers, N. Y.; 8XK at Pittsburgh, Pa.; and 2BF at Montreal, Canada, are entirely representative curves for this station, which has the distinction of fading less than any other station in the system, its peculiarity being that it is, in general, heard steadily or else not at all. The curve below, which was secured at 9ZJ at Indianapolis, is a very unusual one for transmission from 9ZN and would lead to the suspicion that the receiving apparatus at 9ZJ was at fault, except for the fact that on this and other evenings normal curves were secured on all other stations at 9ZJ and almost without fail 9ZN swung violently. In Fig. 13 are shown some curves secured from transmission of 8XK at Pittsburgh, Pa. 8XK swung more rapidly than any other station in the test, often going from extremely

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Transmission by 2JU July 15, 1920.

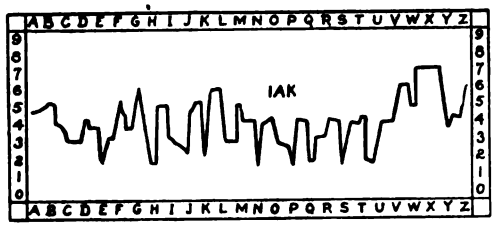
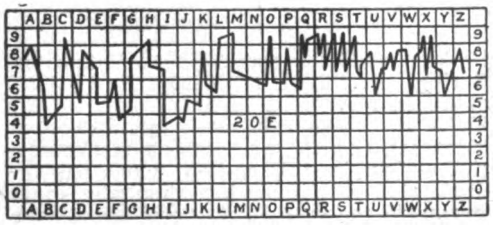


Fig. 14—Normal curves on 2JU.

loud to absolute silence in less time than is taken to sound one letter of the Continental alphabet. The sensation when receiving 8XK is exactly as if someone opened the antenna switch and instantly reclosed it. The intensity of signals does not vary slowly—letters simply drop out. The curve shown in the figure which was secured at 1CK, Braintree, Mass., is not a typical 8XK curve, as in this case the variations, while rapid, were gradual enough to form some sort of a curve. The curves shown below, which were secured at 3ZS in St. Davids, Pa., and at 1AW in Hartford, Conn., are not at all typical of 8XK, and, in fact, for this station amount to freaks. 2JU, 1AW, NSF, 8ER and 9LC lay between these limits, fading rapidly at times, slowly at others, and



Transmission by 1AW July 8, 1920.

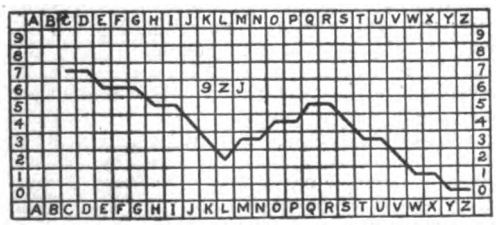
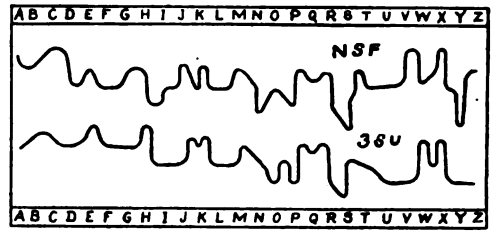


Fig. 15—1AW as copied on coast and inland.

seldom being as steady as 9ZN nor varying as violently as 8XK. Typical curves for 2JU are shown in Fig. 14 and for 1AW as copied on the coast and inland in Fig. 15.

Check Curves

The tests had not been in progress very long, however, before the first evidence began to appear that we were securing some sort of information. This evidence first appeared in the shape of similar curves from various receiving stations. At Washington there were four recording stations. Two of these, (3JR and WWV) are about one mile apart. The curves obtained at 3JR were generally checked with fair accuracy by WWV when that station was on watch, which unfortunately was not often. The curves at 3SU, about four miles southwest,



Transmission by 8XK - July 15, 1920.

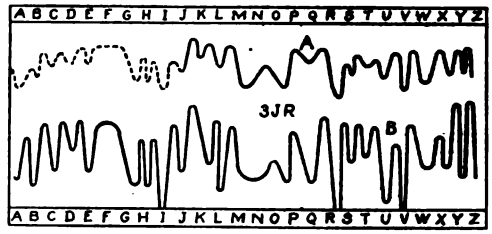
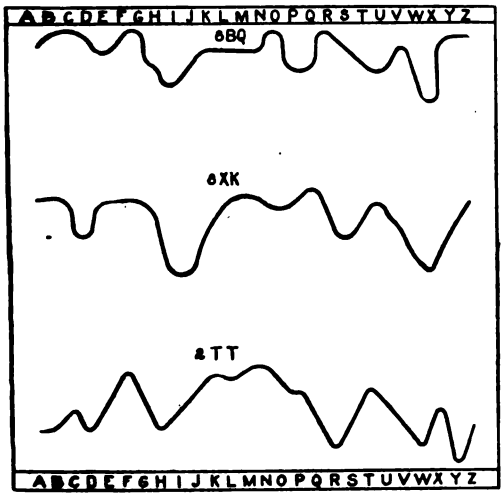


Fig. 16—Check by three stations.

could be depended upon to check the curves of 3JR and WWV with fair exactness about half the time. At other times only partial checks were secured or else the curves were of totally different shape. NSF, Naval Air Station, Anacostia, 5 miles south, was several times checked by 3SU and 3JR but not by WWV. We do not believe that this failure to check throughout the group was the fault of any of the observers, as at the same time that NSF failed to check with any other Washington observer it checked with 3NB at Vineland, N. J., while at the same time 3SU and 3JR checked each other. In several instances 3JR was checked by 3UA in Baltimore, 40 miles northeast. An excellent example of the group check is shown in Fig. 16. The first two curves, obtained by 3SU and NSF, are sufficiently alike, so that there is no doubt of their checking. The curve turned in by 3JR, labeled 3JR$_b$, at first

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sight has no resemblance to the other two; however, when it was redrawn with an amplitude the same as that of the other two curves, the resemblance at once appeared. This is the curve labeled 3JR.



Transmission by NSF - July 8, 1920.

Fig. 17—Checks by distant stations.

It is believed that by this time there will be little doubt that the method is capable of securing results which indicate definitely in what manner the signals are varying at a given receiving station, so long as the signals do not vary with extreme rapidity, in which case audibility meters or any other device known at present for measuring signal intensity variation would be perfectly hopeless.

An example of check curves from stations some distance apart is shown in Fig. 17 on the transmission of NSF July 8. The recorders are 2TT in Yonkers, 8XK at Pittsburgh, and 8BQ at Milton, Pa.

Regional Characteristics.

In New England violent and rapid swinging seems to be the rule. This grows less severe as one goes south or southwest and at points in Pennsylvania, Ohio, Indiana, Illinois, and Michigan it is not even approximately as bad.

There seemed to be, roughly, three types of swing:

(a) a very rapid and very abrupt kind which sound as if the sender had simply omitted a letter or two. The length of the swinging cycle in this case is from ½ to 5 seconds.

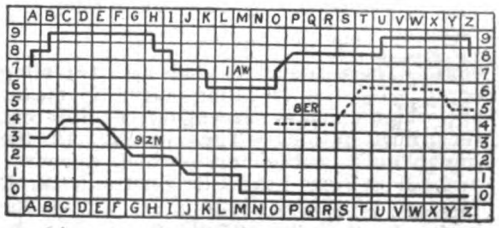
(b) a moderately rapid and more gradual type which gives curved lines almost entirely, the period being from ten seconds to five minutes. This is the commonest type of swinging.

(c) a very gradual slow "drift" of all stations in one direction from the recorder, a cycle taking anywhere from five minutes to several hours.

The first two types are both shown in the upper graph of Fig. 13, obtained at 1CK, Braintree, Mass., on the sending of 8XK, July 6.

The first type of swing is, as far as I have observed, purely a one-station phenomena. The second type also is not followed by other sending stations nearby, but when one sender is swinging in this manner, others near him seldom fail to swing at a similar rate though not in synchronism. This is the most aggravating type of fading as one station swings in while another is going out, so the station being copied is blanketed before it goes out of audibility.

In the long slow third type of swinging all sending stations near each other swing slowly together. Where the swing is unusually slow it is noticed that during the early part of the evening stations in one direction will be heard best while those in another are inaudible, the condition perhaps reversing later in the evening. This sort of swinging cannot be shown by short tests and usually does not cause much



July 6, 1920 - Curves taken on U.S.S Ohio 150 miles east of Cape May.

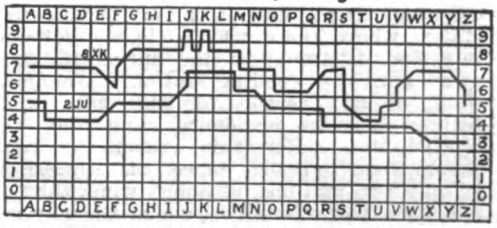


Fig. 18—Fading over water.

difficulty in handling traffic, since stations remain "swung out" long enough so that they do not have to work, or else "swung in" long enough to clear traffic. This type of swinging is especially characteristic of the Mississippi Valley.

Fading is not solely a land phenomenon. The curves obtained at 4AT, Ft. Pierce, Fla., on the transmission of 1AW and 2JU are normal although transmission is almost entirely over water. Fig. 18 shows

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curves obtained on July 6 on board the U. S. S. Ohio, at that time 150 miles east of Cape May, N. J., by Mr. L. C. Young of NSF. These are similar to those turned in by Mr. Young from NSF, at Anacostia.

Traveling Curves.

Similar curves are not always simultaneous. There is such a thing as a traveling curve. By the traveling curve is meant one which appears successively at different recording stations. Thus in Fig. 19 the same "dip" in the curve which appeared at 2YM in New York City on the letter R reached 8AAN at Buffalo, N. Y., at the letter S, 3EN at Norfolk at U, 2JU at Woodhaven, L. I. and 2ZM at Clifton, N. J. at W. This phenomenon occurred many different times, and in almost every instance where there was a clearly defined direction of travel of the curve it was away from the sending station. I cannot think of any reason for this rule, and believe it to be accidental and due to limited data. For this reason, it was thought best to ignore curves that appeared at only two stations, although some thirty-two such were found in which the curves were beyond question the same. Of the type which passed through three or more stations, sixteen were found.

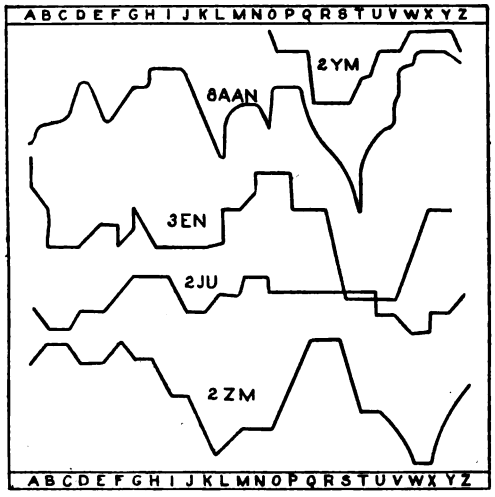


Fig. 19—Traveling curves.

No definite relation between the weather and either transmission or fading has been found nor has any relation between the weather and the direction of best transmission been found in a way that is at all convincing.

Explanation of Cause of Swinging.

Variations in the intensity and direction of received waves have been explained by a number of people as due to reflection and refraction of the waves before arriving at the receiving station. (See Scientific Paper of the Bureau of Standards, No. 353, "Variation in Direction of Propagation of Long Electromagnetic Waves," by A. H. Taylor, USNRF). The variations observed in these tests were actual changes in received power. A satisfactory explanation, based on reflection and refraction effects, involving the existence of interference bands such as are obtained with light, was suggested and discussed by various members of the conference of April 7. The results of the tests seem to bear out this explanation very well.

In Fig. 20 we have at S a source of monochromatic light (say red) from which rays of light travel to the receiving screen by two different paths, first along the straight line SA joining the source and the screen, and second along the line SA'A. Supposing the length of the path SA differs from that of the path SA'A by one wave length of red light, then the rays arriving at A by the two paths will be in phase and will add their amplitudes so that the result is more intense red light at A than would be obtained without the reflector. At another point B, however, the light arriving by the the path SB will not be in phase with that arriving by the path SB'B and hence they will not reinforce each other in the same manner. If the length of SB differs from that of SB'B by one-half a wave length of red light the two waves will differ 180 degrees in phase and hence will tend to cancel each other.

If the amplitudes are the same they will cancel so that complete darkness results. Thus there will be along the screen regions AAA, where the light is more intense than without the reflector, and between these, other regions BBB where there is almost complete darkness. If the reflector is tilted or moved in any direction except its own plane, these interference bands will move along the screen. Supposing the motion is in the direction of the arrow, the bands will move as shown by the arrow at the screen. Suppose now that

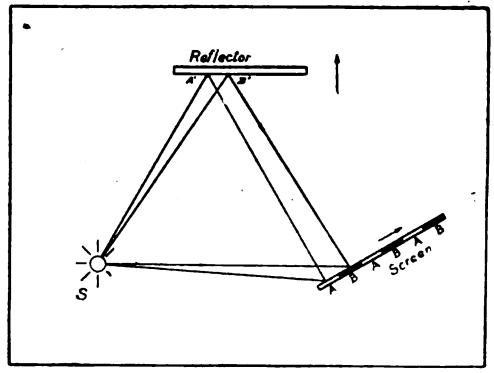


Fig. 20—How interference bands are formed.

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we have at C an eye which is observing the light arriving at this point. This eye will see alternately red light and darkness.

If we consider the case of radio transmission, the source S becomes a sending station, the eye at B becomes a receiving station, and the waves electromagnetic waves. The whole phenomenon takes place on a much enlarged scale, consequently the reflector must also be of considerable size. It seems that a large cloud, fog bank, mass of fumes from an industrial plant, or perhaps the Heavyside layer may operate in this capacity. It is entirely probable that interference bands may also result from waves arriving over two paths, neither of which is direct. In this case movement of a reflecting or refracting member in either path may change the signal intensity. Where the waves have been repeatedly reflected before arriving the chances for violent and rapid swinging are much increased. If we accept the theory that fumes from smelters or steel mills may collect in sufficient masses to act as reflectors, this seems a plausible reason for the phenomenally rapid and erratic swinging of station 8XK which is located in a region of many such plants. It is just as well, however, to admit at once that other prominent stations in the same region, namely 8DA at Salem, Ohio, and 8ZW at Wheeling, W. Va., do not at all duplicate these rapid swings. The rapid swings of 8XK are, however, not due to the sending apparatus, as at the same time that one recorder will hear anywhere from 15 to 28 swings for 8XK, others will hear three or four. We have no record of 8XK being received without fading except by stations very close by. Reflecting need not necessarily be involved in the production of interference bands. Refraction will answer just as well to change the direction of the waves if we can find a mass of vapor whose dielectric constant differs from that of the normal atmosphere through which the waves are traveling. Neither the reflecting nor the refracting body need be at high altitudes. They may be at the elevation of the sending and recording stations and to one side of the line joining them.

Inverse Curves

Another type of curve may be designated as the inverse curve. The curve appearing at one station is found inverted at another. The upper part of Fig. 21 shows inverse curves received at 1TS, Bristol, Conn., and 8ER, Saint Marys, Ohio, from 2JU at Woodhaven, L. I. Singularly enough the cases of inverse curves are, without exception, simultaneous; that is to say, the positive peak of the curve appears at one station on the same letter for which the negative curve appears at the other; again, without exception, each case in which the curves are undoubtedly inverses is that of a very slow swing which lasted from 1 to 8 minutes. It is this simultaneous appearance of the curves which makes them difficult to explain, and leads to the suspicion that they are coincidences. A special case of inverse curves was that in which the positive curve was obtained at both station 3JR, Washington, and 3UA, Baltimore, while the negative curve was obtained at both 3BZ, Danville, Va., and 3BN, Norfolk, Va., giving complete check on the observations. The transmitting station was 2JU. It will be noted that the stations of a pair which obtained the same curves are at about the same distance from the sender, suggesting at once the thought that we have traveling curves, and the case is the special one in which the fading was sufficiently regular so that the fading curve which appeared at a particular station would be repeated

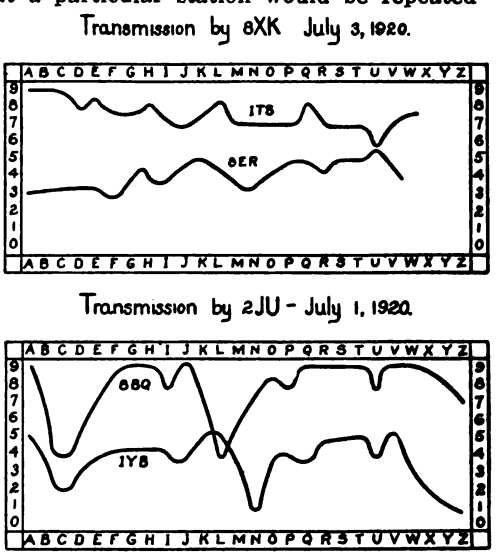


Fig. 21—Inverse check curves.

by others near it and the fading bands were spaced so regularly that it was possible to find further along the line of their travel other stations at which a dark band was appearing while a light one was crossing the first stations. With enough recorders it might be possible to trace in this manner with a fair degree of accuracy, the system of light and dark bands.

Clearly defined inverses are not frequent. Six inverses were found during the last four weeks which were fairly definite. One of these is shown in Fig. 21 for the transmission of 2JU on July 1 as received at 1TS, Bristol, Conn., and 8ER, St. Marys, Ohio. There does not seem to be any reason why stations so situated should obtain curves having any definite relation to each other. Perhaps

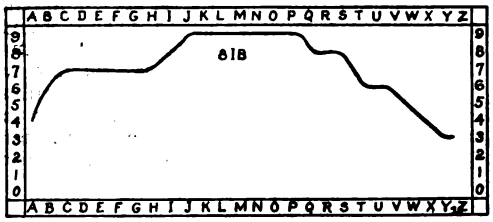
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inverse curves are purely accidental. Certainly they would be more convincing if more numerous.

The other inverse curves obtained were as follows:

Date	Sender	Recorders	
7/3/20	8XK	8ER	1TS
7/6/20	8ER	9ZJ	3NB
7/8/20	1AW	1CM	8AAN
7/8/20	2JU	3BZ	8AAN
7/8/20	8ER	3BZ	3UA

A possible inverse curve system is shown in Fig. 22, for the sending of 2JU on June 1. 8IB is at Columbus, Ohio, 8DR at



Transmission by 1AW – June 1, 1920

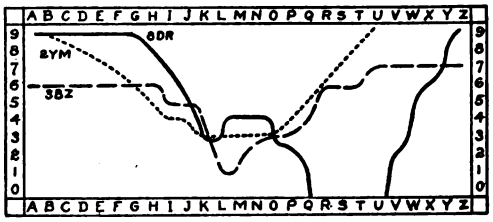


Fig. 22—Checks and inverses; also a doubtful traveling curve.

Detroit, 2YM in New York City. The curve at 3BZ (Danville, Va.) is possibly a traveling curve related to the one at 2YM.

Distance Effect

Fading is a long distance phenomenon. Repeated attempts were made at 1TS in Bristol, Conn., 12 miles removed from 1AW, to secure fading on 1AW by detuning the receiver or by dimming the tube filaments so as to decrease the signal intensity. The intensity remained perfectly uniform, however, and showed not the faintest tendency to fade. The same observations were made by 2YM and 2JE in New York, on the transmission of 2JU, Woodhaven, L. I., also by 3SU, 3JR and WWV in Washington on the transmission from NSF at Anacostia. This does not mean that there is a fixed distance below which fading does not occur. What it does mean is that fading does not occur until the distance is a considerable proportion of the normal transmission range of the station. In cases where transmission conditions are very bad, fading will occur at distances which are short. For instance, the distance from Washington to Baltimore is only 40 miles. It is almost impossible for stations in these two cities to work together on any wave length below 500 meters, as signals swing violently at all times. Similarly, the distance from Lawrence, Kansas, to St. Louis, Mo., is about 120 miles, a very short distance as radio transmission goes in this region. Yet, so far as I know, successful communication was never accomplished before the war by a St. Louis station with any station in Lawrence, Topeka, Leavenworth, Kansas City, or any of the surrounding towns. That the statement regarding ranges in the region is correct may be seen from the fact that any of the stations in the cities just mentioned could work over St. Louis to stations in Tennessee and Kentucky with perfect ease, while at the same time St. Louis stations could work over the state of Kansas, say, to Danver, without any difficulty at all. I am of the opinion also that fading does not occur in general within the daylight range of a station. This statement will not bear very close inspection, as in one of the cases just mentioned, that of transmission from Washington to Baltimore, the cities are within daylight range of each other. Signals do not fade in the daytime; on the contrary, in this particular case, they are stronger than at night. But, as stated, signals fade very badly at night.

Determination of Transmission Conditions.

In an attempt to connect fading with weather conditions and with normal transmission, it was desirable to establish some sort of a criterion as to the excellence of transmission on a particular date. No really good way of doing this was found. The method adopted can be best explained by example. In order to establish the normal intensity at which station 8XK at Pittsburgh was heard at 1CM, Laconia, N. H., the mean intensity of the signals of 8XK at 1CM for each day was first established by inspection of the curves obtained at 1CM on that date. The question then arose whether in averaging the intensities for the test period, those evenings should be considered on which 1CM had listened but failed to hear 8XK. If the failure was due to a defect in the apparatus, the results for the evening should, of course, be thrown out. It was decided however, that the operation of the stations was constant enough so it could safely be assumed that apparatus failures had not occurred. The mean intensity was accordingly obtained by averaging the intensities on all the evenings in which 1CM listended for 8XK, regardless of whether the station was heard or not. The mean intensity so obtained was then used in determining whether on a particular schedule, the reception of 8XK at 1CM was good, normal, or poor. No definite relation

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between weather and transmission was found.

Almost without exception the recorders stated that they believed fading was not a variation in signal strength but a shift of wave lengths, as they could recover a station which had swung out by retuning the receiving set. We requested them not to attempt this since it would be impossible to tell whether the variations in received signal strength were due to a change in incoming power or due to mistuning. A laboratory check of this scheme showed conclusively that two observers could not get results that were even approximately alike if the receiving apparatus was retuned during the test. For this reason the QST call preceding transmission was made very long so that tuning might be finished before the test started. Subsequently it was found that when ICW signals were being received they could not be recovered by retuning when they had faded out. This observation was checked by several of our recorders at Pittsburgh, Chicago, and Hartford.

A possible explanation of this difference between spark signals and ICW signals, which also explains the apparent shift in wave length, may be given, following the ideas used by A. H. Taylor in explaining the difference between the variations of direction observed with damped and continuous waves. (Bureau of Standards Scientific Paper 353, already mentioned). Return to Fig. 20 and the formation of interference bands. Our source was monochromatic and a single set of interference bands, alternately red and black, resulted. An eye which could see only red light would then see alternate red light and darkness as the bands passed across it. Supposing the source of red light were replaced by one of white light. Interference bands of red light would still be produced and the red-seeing eye would still see alternate red light and darkness. If, however, another eye, a blue-seeing eye, were placed alongside of the red-seeing eye, it would see alternate blue light and darkness, and since the wave length of the two is not the same the interference bands would not be at the same places. Hence while one eye had darkness the other one would be out of phase with it and would have some light. Thus, by using the proper eye it would be possible at all times to see some light. The radio reception case is similar to the rather fanciful light system. The spark transmitting set emits not one wave but a band of wave lengths; the receiving set, however, can detect only one of these waves. Regenerative sets are notoriously very sharply tuned. If then the condition is such that a dark band for the particular wave length at which it is tuned is crossing the receiving station, it will detect no signals, although at the same time power is arriving on a slightly different wave length still within the band of wave lengths emitted by the sending apparatus. While there is some disagreement about this band, most of the recorders consulted agree that the wave length variation detected lies within the band of wave lengths normally emitted by the sending station.

With an ICW station we have the case of the monochromatic source. Only one wave length is being emitted. Hence when a dark band for that wave length crosses the receiver no signals can be found. At close range this does not hold true, since an ICW transmitter emits other wave lengths too weak to be detected at a distance which give the effect of a particular wave at close range.

An excellent example of this is NSF, which at first had great difficulty in initially "raising" distant stations although after they had tuned NSF in, the signals were reported as very loud. This is sufficient proof that NSF, at a distance, is very sharp. In Washington more difficulty by far is experienced in tuning out NSF than in tuning out 3KM, 3XF or 3JR, all of which are 1 K.W. spark transmitters nearer by.

The side frequencies of the ICW transmitter are those which differ from the main frequency by the tone frequency. Mr. Conrad of 8XK has suggested a possible means of avoiding QSS based on the double system of inverse bands presented above. His suggestion is the use of an ICW or CW transmitter emitting two waves some ten meters apart, and two independent receivers tuned to these two waves. It would be necessary to have these two receivers working into a common amplifier or perhaps into the two halves of a split head set. Mr. Conrad has attempted to operate an ICW transmitter in this manner but we do not know at present with what degree of success. It will be seen that an ICW transmitter is not the answer to the fading problem.

The statement made regarding the general opinion as to the rate of fading in various parts of the country was confirmed by the tests. Fading in the Mississippi Valley is of the type designated as "C". In the region around Pittsburgh all three types of fading are found, mainly "B" and "C", while in New England the "A" type of fading seems to be chronic, regardless of the location of the sending station. This seems remarkable since many of the New England records were those for 1AW, 2JU and NSF, all close to this region.

Summary

Test signals were transmitted three nights each week during June and July,

(Concluded on page 22)

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Transcontinental Relay Tests in January

FELLOWS, we have not had a relay against time across the country for a long time, and we do not know how reliable our trunk lines are. Our Operating Department proposes to find out, by a series of test messages to be sent on the nights of January 14th, 15th, and 16th. There is nothing so thrilling in amateur radio work as a Transcontinental Test, and we know that this announcement will excite the sporting blood of our entire membership and get everyone up on their toes for the fateful nights.

The scheme at present is in purely tentative form, the actual routing of the messages being left to the Division Managers, in whose hands the matter has been placed. It is proposed to test the northern, the central, and the southern route to the West Coast, and every A.R.R.L. Division will participate. We may be sure that the stations which have been doing good work will all get a chance to chime in on these tests.

There will be three messages on each night, with a reply to each to be secured and transmitted back, making a total of eighteen messages. To make the relay a success the reply must be secured and returned to the point of origin of the original message on the same night. It will be remembered that the last time we tried this, before the war, the total elapsed time from New York to Los Angeles and return was an hour and twenty minutes. Let's try to beat that record.

While it must be understood that the plans are in extremely tentative form at this writing, and full details will not be available until the January issue of QST, it is proposed to send the messaages over something like the following routes:

No. 1 will start in Portland, Me., and end in Portland, Ore., via Boston, Hartford, Washington, Pittsburgh, St. Marys, Chicago, ???, Portland.

No. 2 will start in Hartford and end in Los Angeles, via New York, Wheeling, Danville, Va., Atlanta, Little Rock, Dallas, Roswell, ???, Los Angeles.

No. 3 will originate at San Francisco and be destined Boston, routing via Salt Lake City, Denver district, Anthony, Kan., St. Louis, Indianapolis, Columbus, Pittsburgh, Philadelphia, New York, Hartford, Boston.

The Division Managers will change these routes as they see fit, shortening distances when necessary, filling gaps, or arranging for alternates. Let your Division Manager hear from you.

On the nights of the relays we will ask a newspaper in the cities where the messages start to hand us a sealed message of about ten words, addressed to another newspaper located in the cities where the messages terminate. The messages will not be opened until ten minutes before the starting time, altho we expect to announce the names of the papers to whom the messages will be addressed so the terminal stations may make arrangements for soliciting the replies. Each message will bear a special prefix. On the night of the 14th the prefix will be "Transcon 14 official nr 1", and the reply to No. 1 will be "Transcon 14 reply to nr 1." The only difference on the other nights will be the change in dates.

Now is our chance, fellows. We want the air to be absolutely quiet for these tests, so that we won't have to say that QRM is the cause for our trouble. Let us start right now to get the hearty cooperation of every amateur and ask him to do all in his power to eliminate interference on these nights. We have plenty of time to go after every problem involved, and there is no reason why we should not make a big success out of it, add to the glory of Amateur Radio, and get a whole lot of sport out of it for ourselves.

Bear in mind that all of the above is tentative, and the Traffic Manager cordially invites further suggestions.

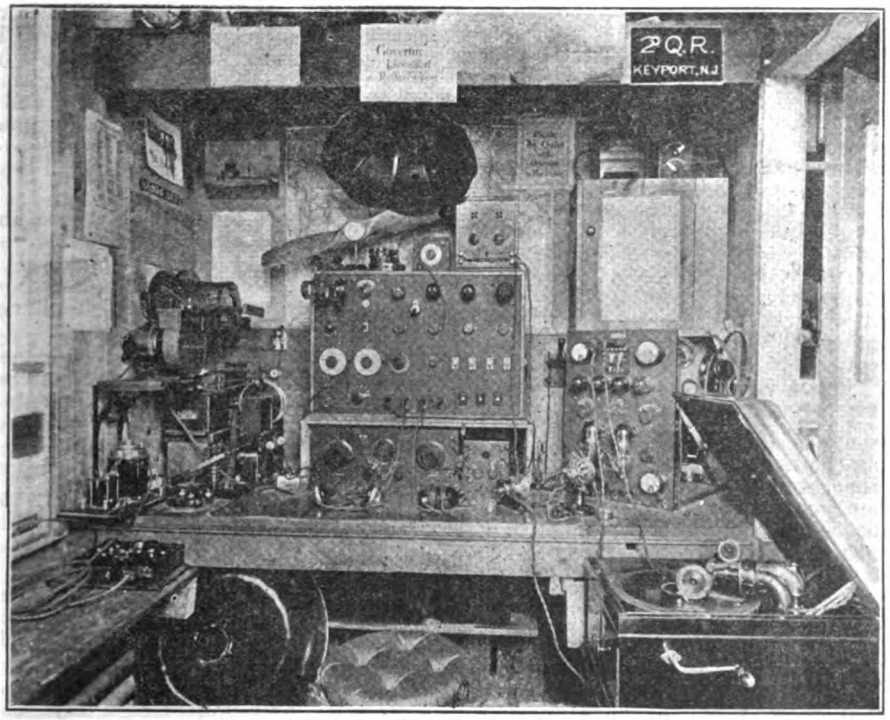


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2QR Heard in Scotland?

THERE is every indication that a new record for amateur transmission was established on October 6th when the signals of 2QR, an A.R.R.L. station operated by Messrs. Harold and Hugh Robinson, Keyport, N. J., were reported heard in Scotland.

2QR was described in the May QST, but the new photograph reproduced here shows some later equipment and illustrates the station as it was on the date of this record. Considerable work has been done with the small DeForest radiophone shown, the input to which is about 100 watts. In its transmissions 2QR has often asked for reports of its signals, and this has brought replies from Ohio, Illinois, and particularly from Napanee, Ont., a distance of about 1150 miles, all of which are surprising for this small set. The transatlantic record is reported in the following letter received by Mr. Robinson:



Denmill Cottage, Peterculter,
Aberdeenshire, Scotland.
12th, Oct. 20.

Dear Mr. Robinson:

I write to say that my friend and I received your transmission on Oct. 6th to your friend. I could not be sure of this gentleman's name, but we heard the record "Roamin' in the Gloamin'", by Harry Lauder, and the other tune, very clearly; also that your power at the time was 100 watts. I write you this as no doubt you will be interested to learn that you can be heard over here with so small a power. I was using 3 valves. I would be greatly obliged if you could transmit again (radio phone) say 3 weeks after you mail your letter to me, as the letters take some time to reach here. As regards time, two hours after the transmission referred to above would suit, hoping you will manage to co-operate in our tests.

Your transmission was received here at about 6 P.M., G.M.T., so if you could transmit 2 hours later than the time you transmitted on Oct. 6th it would suit me nicely as this would be about 8 P.M., G.M.T. As I do not know how long your time is after ours, this is the only way we could arrange anything definite.

Yours faithfully,
(Signed) Geo. W. G. Benzie.

We congratulate Mr. Robinson as, if true, this is a most amazing record, even

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for the ultra-efficient Continuous Wave. QST does not regard it as at all impossible, and Mr. Robinson informs us that the reported data concerning the time, the speech, and the records played, coincide with the facts, so that it looks "real". Mr. Robinson, however, is conservative and seriously doubts it, and has written for more substantial details.

There is one possibility that occurs to us: 2QR's signals might have been picked up at some transatlantic station like NFF and used to modulate the emission of the latter. For example, of late most of us have been hearing the time signals nightly from NSF on 250 meters. The note is unmistakably Arlington's, and generally the actual signature, "NAA", comes thru. This is accomplished by the reception of NAA's signals at NSF, the latter station then feeding the received signal acoustically to the microphone of its radiophone transmitter and so repeating it on NSF's own power and wave length. While very interesting QST sincerely hopes that the practice will not become a general one among radio telephone stations, for it will result in untold confusion in the identity of station calls and wave lengths. We particularly want to point out that it in effect amounts to the signing of incorrect call letters and so is illegal. Further investigation will be necessary before it is apparent whether Mr. Benzie heard the actual signals from 2QR, or repeated signals from some station of higher power.

This opens discussion on a new idea in relaying which has been proposed by Mr. Ben Emerson, 5ZG, Dallas, Texas. Mr. Emerson suggests that if a route of CW stations with independent receiving and transmitting aerials were arranged across the continent, with the signal picked up on the receiving aerial and fed into the transmitter operating simultaneously on the transmitting aerial at another wave length, the delay now incident to intermediate relays would be completely eliminated and New York speech or signals could be received practically instantaneously in California. In other words, it involves simply a chain of repeaters acting as NSF does in the case of NAA's time signals.

This would be automatic relaying and would remove all the fun from the game except the scientific interest of the performance, but it would result in a speed of relaying never before attained, and would make it possible for one station to address the whole country, as all the receiving stations surrounding each transmitter could of course listen in on the transmission. Who knows but that someday our A.R.R.L. may have Trans-continental Super-Routes fashioned on this scheme?

A.R.R.L.—B. S. FADING TESTS

(Concluded from page 19)

1920, by six sending stations operating at 250 meters wave length and observations of the intensity of the signals were made by fifty recording stations. An average of twenty-eight recorders listened for the test schedules on each of twenty-one evenings, obtaining 1260 curves of signal intensity variation.

Frequent checks between curves at adjacent and sometimes distant receiving stations were found. Traveling curves, appearing successively at various recording stations, were found. No definite connection between weather and transmission was found. Inverse curves were found but infrequently and are not considered as other than chance variations. Three types of fading were observed, a rapid and very abrupt type, appearing mainly in New England, a less rapid and less abrupt type found in all parts of the test territory, and a very slow type covering large territories and affecting all sending stations in the region alike.

There is no marked difference in the manner of fading for various types of sending sets. However, a damped wave that has faded out can often be recovered by retuning, which cannot be done for continuous waves.

The tests furnish good evidence in support of the belief that radio signal variations such as fading and swinging are caused by varying reflection and refraction of the waves.

SELF-RECTIFYING C.W. SETS

(Concluded from page 10)

the grid circuit, and both it and C' are of .001 mfd. max. A grid biasing battery, B, is used, the value depending on the tubes. 22.5 volts being about correct for E's, T's, and Moorheads. Grid leak R has a value of about 10,000 ohms for these tubes also.

L is a 3 or 6 volt battery lamp, used to indicate the flow of plate current in lieu of a meter.

Mr. Ruckelshaus states that this circuit is very critical in adjustment and will require some patience before satisfactory results are obtained, the grid coupling in particular requiring careful adjustment. It is possible that the Colpitts circuit would be found superior in performance, as well as much simpler.

This A. C. Radio Phone propagates a 60 cycle hum but not over the distance to which the speech will reach nor in any case, when properly adjusted, of the same order of audibility as the speech. And so it seems likely to find a ready reception among amateurs.

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Duo-Laterals, and More on Tuning

By A. L. Groves

HAVING written considerable about the Honeycomb coils in previous issues of QST and received many requests to give some data on the new Duo-Lateral Coils in comparison with the Honeycombs, I will endeavor to give the readers my opinion of these coils as I found them after a thorough trial, covering a period of several weeks.

First of all let me say that for ordinary tuning there is no great difference between the two types of coils in actual signal strength received. The Duo-Laterals are somewhat better made, present a better appearance, and taken as a whole give a little better results than the Honeycombs, as they stand up better under condenser capacity, which is a decided advantage, especially in working through interference. There is, too, a more uniform graduation between the different size coils, which gives them a little advantage in tuning over the complete scale of waves.

Like the Honeycombs, their greatest advantage over the old style apparatus is on the long wave lengths and they are not at all suited to short wave work, especially below 500 or 600 meters, and the difference between the Duo-Laterals and Honeycombs on the short waves is practically nil. Delicate instruments would most likely detect a considerable difference in them but this difference is not apparent in actual audibility as detected by the ear.

The accompanying Table I gives the range of waves over which all coils from US-500 to US-1500 inclusive will tune when used in the secondary circuit and shunted by a 23 plate condenser. It will be seen that the maximum wave possible with the US-1500 coil with this size condenser is a little over 18,000 meters, which is about 1,000 meters more than the corresponding Honeycomb coil will give.

If you are using a 43 plate condenser the condenser reading for a given wave will be approximately one-half of those given here. For instance, if you wish to tune to 11,000 meters with a 43 plate condenser, the readings would be about 32 degrees for US-1500, 45 degrees for US-1250, 76 degrees for US-1000, and US-750 would then tune to 11,000 meters also, with the condenser at about maximum capacity. However, I recommend a 23 plate condenser for use in the secondary because better tuning can be done with a condenser of this size, since a movement of two degrees only effects the tuning approximately the same as a movement of one degree with the larger condenser. Also the minimum capacity is much less with the small condenser, which is a very important consideration if the set is to be used on short waves.

Tuning with these coils is done in the same manner as with the Honeycombs as explained in Sept. QST. Tables have appeared from time to time giving the approximate wave that the different stations use, so when you want to try to hear a certain station you will refer to some of these tables and find the wave used, then refer to this table and note the coil and condenser capacity required in secondary circuit. After selecting these, balance out the plate and primary as previously described and you will be very close to the wave desired, remembering the greatest signal strength is had from any certain wave by using the largest coil listed with the smallest amount of condenser, but greater selectivity is obtained by using a smaller coil with a corresponding increase of condenser capacity.

For short wave work I will mention that the US-50 coil is the correct value for amateur waves in the secondary, responding to about 225 meters with the secondary condenser at 30 degrees.

TABLE I

Reading of Illinois 23-plate condenser.

US-500	US-600	US-750	US-1000	US-1250	US-1500	Secondary Wave Length
12						1,500
22	0					2,000
33	17					2,500
44	32	8				3,000
66	47	18				3,500
90	62	28	10			4,000
114	70	43	19			4,500
148	104	60	27	0		5,000
180	128	74	35	9		5,500
	150	90	45	16	0	6,000
	170	106	53	23	8	6,500
		123	62	29	14	7,000
		138	71	37	20	7,500
		156	80	46	26	8,000
		172	92	53	32	8,500
			105	61	39	9,000
			130	76	51	10,000
			153	90	64	11,000
			180	108	78	12,000
				131	92	13,000
				162	108	14,000
					123	15,000
					138	16,000
					154	17,000
					172	18,000

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For 600 meter work coil US-150 is correct for the secondary and will respond to this wave with condenser about 20 degrees. The Radio Compass wave of 800 meters is best tuned to with coil US-200 in secondary.

It has come to my attention that notwithstanding the numerous articles written in regards to tuning with the Honeycombs (which includes the Duo-Laterals as well), there are a great many who do not quite understand the value of tuning the **primary** or the importance of having the correct **size primary** condenser for their particular aerial. This is of the greatest importance and good results are impossible on all waves unless the primary is properly tuned.

The smaller the aerial the smaller the primary condenser that is necessary to shunt the coils in the primary to make them "overlap" so as to make a progressive increase in wave length from one size coil to the next larger size coil. This is due to the increased capacity of the larger aerials and, consequently, shunting the coils with a certain size condenser does not produce as great an effective wave length increase.

In this connection I have made some experiments with various length aerials and have deduced the following tables as a range of wave lengths to which the various coils will respond when used as a primary inductance on a SINGLE WIRE aerial with a 43 plate (.001 mfd.) condenser **in shunt.**

It will be seen from Table II that there are a lot of waves to which one cannot possibly tune the primary circuit with a .001 Mfd. condenser when used in shunt. For instance, take the 200 foot aerial. Waves between 375 and 475 meters cannot be tuned, waves between 950 and 1300 meters cannot be tuned, waves between 1500 and 1600 cannot be tuned, waves between 2200 and 2300 cannot be tuned, and waves between 2900 and 3000 cannot be tuned. Referring to the whole table, if the maximum wave of one coil is smaller than the minimum wave of the next size coil, then the waves between these cannot be tuned. On the long waves, with large coils, most waves overlap enough to tune without a break. The two noticeable exceptions with the aerials above are waves between 13,800 and 14,000 meters with the 400 foot aerial, and waves between 14,200 and 16,500 meters with the 500 foot aerial. To tune between 14,200 and 16,500 meters with this aerial the writer used coil L-750, with L-600 as a loading coil, and found this arrangement to respond to waves between 14,000 and 16,500 meters, which was just right.

TABLE II

L, LL, or US	50′ Aerial Min.	50′ Aerial Max.	100′ Aerial Min.	100′ Aerial Max.	200′ Aerial Min.	200′ Aerial Max.	400′ Aerial Min.	400′ Aerial Max.	500′ Aerial Min.	500′ Aerial Max.
25	120	325	185	340	325	375	375	400	425	450
35	170	485	275	510	475	600	500	625	550	650
50	235	650	375	685	600	750	675	775	700	800
75	475	900	550	925	625	950	800	975	900	1000
100	550	1250	750	1275	1300	1500	1400	1600	1500	1650
150	850	1825	1100	2050	1600	2200	1900	2600	2000	2900
200	1100	2600	1500	2700	2300	2900	2600	3300	2900	3800
250	1425	3400	1950	3600	3000	4000	3300	4200	3800	4500
300	1800	4100	2500	4400	3500	5000	3900	5500	4500	5900
400	2300	6500	3200	6700	5000	7000	5500	7500	5900	8000
500	3000	7500	4200	8000	6700	9200	7000	9500	8000	10000
600	4000	8700	6000	9500	8000	11000	9000	11500	9200	12000
750	4700	10000	6400	10100	9800	12000	11000	13800	11800	14200
1000	6800	14000	8700	15000	13000	17400	14000	18000	16500	19000
1250	8400	17000	10000	17500	16000	22000	15500	24000	——	——
1000	9500	20000	12800	20300	19600	26000	——	——	——	——

As you can see from the above table, if your aerial has an effective capacity not greater than that of the single wire 100 feet long you will need nothing larger than a 43 plate condenser for the primary, as all waves overlap.

However, as most aerials have a greater effective capacity than a single wire aerial 100 feet long, a larger primary condenser is necessary, especially on the short waves; but it is possible to tune to all of the shorter waves with a 43 plate condenser, with somewhat less efficiency, if the primary condenser is used in series instead of parallel, and it is mainly for this purpose that the series-parallel switch is necessary on my own set.

Table III gives the advisable working wave length range of the various coils when used in the primary with the 43 plate condenser **in series.**

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TABLE III

L, LL, or US	Single Wire 400' Aerial Min.	Max.	Single Wire 500' Aerial Min.	Max.
25	190	200	190	210
35	200	225	200	250
50	300	400	300	500
75	500	600	500	700
100	550	700	600	800
150	600	1000	600	1200
200	1000	1600	1000	1800
250	1500	1700	1600	2000
300	1500	2800	1500	2900
400	2500	3700	2500	3800
500	3000	4500	3000	4600
600	4000	5500	3000	5800
750	5500	6900	5500	7000
1000	6500	9800	6500	10000
1250	8000	11000	8000	11200
1500	10000	13500	10000	14000

It will be seen that for a given wave a much larger coil has to be used with the condenser in series than when in parallel. Also, a given coil will respond over a much wider range of waves and it requires less changes of coils in primary, and all waves can be tuned to. This is done at a somewhat lower signal strength, but the fact that all waves can be tuned to and the ease of tuning with the condenser in series makes it often very desirable to use the series method, even at a sacrifice in signal strength.

Notwithstanding the above, it is very desirable to use a large condenser in the primary circuit as its large capacity will give better results for all around work, as it gives a wider range of waves for each coil, allows smaller coils to be used with the series method, and makes frequent changes of coils unnecessary. In his regular work the writer uses one of 115 plates and even this is not large enough with extra long aerials.

The above may serve to explain why there is so much of a howl being set up by amateurs that their coils refuse to "oscillate" on various waves, where it is not the fault of the coils at all but the fault of the set not being properly balanced out to suit the coils, or lack of patience on the part of the operator in not going over each coil and balancing out by the click method as previously explained. If your coils are balanced out as explained, you can very easily tell then what waves you are missing through your condenser being too small. If you get the clicks over the entire range of waves your condenser is large enough; if not, it is too small.

Flicker Balances Without Current Waste

*By R. U. Clark, III**

DUE to the lively discussion appearing in recent numbers of this magazine on the above mentioned subject a few real workable ideas that will save time, money, and perhaps a bit of temper, are submitted which ought to settle the question for good and all.

Resonance in the transmitting set will reduce flickering, but under usual conditions cannot entirely eliminate it. The only other solution of any account is found in the use of some sort of a current-consuming balance which will, by operating when the transformer is idle, keep the line current consumption constant. This may of course slightly dim the lights on the same circuit, but all flickering can be cut out.

Almost any instrument which draws current can be used as a balance, but care must be taken to see that whatever is employed for this purpose really does balance the consumption of the transmitter. In addition to this the balance should use and not waste current.

Four or five very interesting applications of common devices which can be used as current balances will be outlined. It should of course be understood at the start that

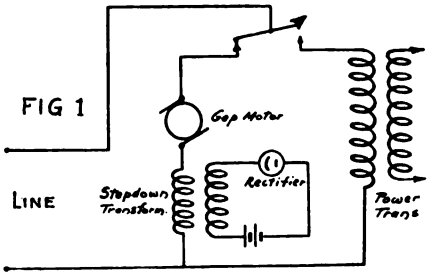


FIG 1

these arrangements require the use of a double contact key. It is a very simple matter to mount a second set of contacts on almost any key in such a manner that opening one circuit closes the other at the same time, or near enough so for practical use.

A very simple circuit for use with either a gap motor or a battery charging balance is shown in Fig. 1. In this sketch a rotary gap motor and a small battery charging step-down transformer are connected in

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series, both being used at once to balance the transmitter. Until the key is pressed both motor and charger are in constant operation, but as soon as the circuit through these devices is broken about the same amount of current is sent through the primary of the transformer or coil. In this way, when the key adjustments are set fairly close, the current consumption is practically unbroken. The gap motor will not be reduced greatly in speed unless the key is held down for some time. This last fact will remove the temptation to keep the key depressed.

The simple devices mentioned so far need little explaining. It might be well to state here that the gap rotor and motor armature should be designed so that they will possess considerable momentum at speed. This is necessary to keep the pitch of the spark note up to the desired point during breaks in the circuit of the motor.

By making the current consumption of the balancing devices as near equal as possible to the load imposed by the transmitter excellent results can be obtained by the method outlined, and if a good double break key, properly adjusted, is used, complete satisfaction will be obtained. The operator can of course make use of any other desired combination for the balance—these are merely examples.

In connection with the system just mentioned some new ideas on obtaining high notes for quenched gap work, by the use of a special kind of balance, should be of interest. Several methods of doing this, all involving the same apparatus, will be given here for use with varying types of transmitters.

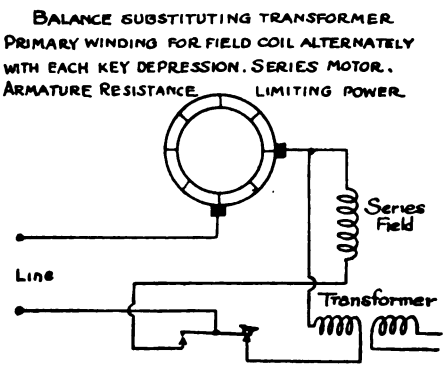


FIG. 2

A simple explanation of the operation of the scheme for obtaining a high spark note with alternating current can be summed up as follows. The commutator of a high speed motor, specially prepared, is connected in series with the coil or transformer primary. By varying the speed of this motor a wide range of spark notes can be obtained in the transmitter. By the use of a double-contact key to open the path to the motor COILS during key depression, and allowing varying portions of the current to pass through the commutator alone, almost any amount of power and nearly any desired pitch can be had under proper conditions. A third brush connection will be necessary to get full power through the commutator, but this is easily arranged.

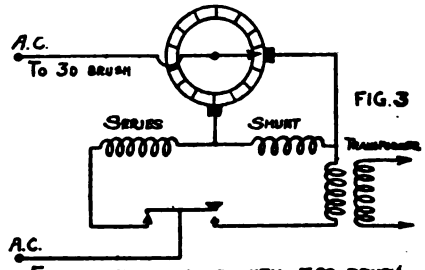


FIG. 3

FULL POWER BALANCE WITH 3RD BRUSH. COMPOUND WOUND MOTOR SHOWN.

For example, those who use small coils which they would like to run off the "city current" and get a high spark note from, can do so by connecting the coil primary in series with a commutator motor of the series type, as shown in Fig. 2. In order to get any appreciable amount of current through in this manner a motor of fairly large size must be used. If only direct current is available the outer edge of the commutator can be filed at each slot, one brush removed and a vibrating brush fitted to work on the notched end of the commutator, and a brush bridging condenser can be fitted to cut down local sparking. This scheme is intended for use where only a very small amount of power is needed, and a high note rather than distance transmission is the object sought. The motor will act as an impedance coil and prevent flickering more or less, but in the simple form just described will not act as a balance. The idea here has been only to show how a high note is obtained by breaking up the primary circuit with a series motor.

A pure balancing and full power scheme for use with larger coils or transformers is shown in Fig. 3. By attaching a third brush in line with one of the original brushes, and using a double break key, the "juice" can be alternately chopped by the commutator alone, and used, as a balance, to run the motor when not so chopped. This will keep the armature moving constantly. This method can be used with either a shunt or series motor, as the transformer current does not pass through the motor as is the previous case, but from main brush to auxiliary, being broken by

(Continued on page 27)

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The Measurement of High Resistance

*By R. V. Achatz**

A well known radio amateur, in discussing with the writer some experimental work, said that he was having trouble in measuring the resistance of grid leak resistances which he was constructing. This suggested the fact that the writer had seen several articles describing the construction of high resistances but did not recall any description of methods of measuring their resistance after they were constructed. For this reason it was thought that a description of one method might be interesting.

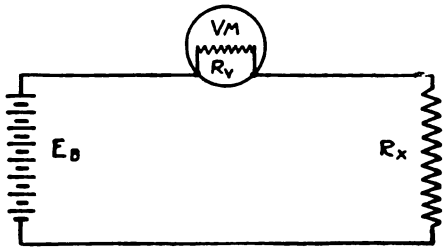


FIG. 1

An easy way of measuring the approximate resistance of any piece of apparatus is by means of a voltmeter of known resistance. The circuit is arranged as shown in Fig. 1, with the voltmeter in series with the resistance to be measured. The readings of the voltmeter, both in series with the unknown resistance and directly across the battery, are taken. The unknown resistance is then calculated from the formula

$$R_x = R_v \frac{E_b}{E_v} - 1 \qquad (1)$$

where R_x is the unknown resistance, R_v the voltmeter resistance, E_b the battery voltage and E_v the reading when the voltmeter is in series with the resistance.

This method depends upon the fact that the voltmeter reads the resistance drop of voltage between the terminals of the instrument and the battery voltage is then equal to the sum of the voltmeter reading and the resistance drop in voltage across the unknown resistance, or

$$E_b = E_v + iR_x \qquad (2)$$

The current i is equal to the battery voltage divided by the total resistance of the circuit, or

$$i = \frac{E_b}{R_v + R_x} \qquad (3)$$

By substituting this value of i in (2) and performing some simple algebraic transformations the expression in the form (1) is secured. The writer does not attempt to remember this expression but works it out whenever it is necessary to use this test. If the resistance of the voltmeter is not known it may be determined by placing the instrument in series with a known resistance and taking the same readings. In this case R_x is known and R_v is unknown.

The most satisfactory instrument for this test is one having a high resistance and many radio amateurs can secure access to such an instrument by cultivating the acquaintance of the Wire Chief at the nearest telephone exchange. A testing voltmeter forms part of the equipment of the trouble testing desk and is arranged with switching keys to make the various connections. One standard type of testing voltmeter has a double scale with a range of four volts and forty volts. The four volt scale has a resistance of 10,000 ohms and the forty volt scale has a resistance of 100,000 ohms. In many cases charts or curves have been worked out which will give the resistance directly from the voltmeter reading with a given voltage of the testing battery. With care in taking the readings, the accuracy of the measurement with this type of voltmeter should be within about five per-cent, which is usually sufficient for the purpose.

*Asst. Professor in Telephone Engineering, Purdue University, Lafayette, Ind.

FLICKER BALANCES

(Continued from page 26)

the mica segments. In Fig. 2, the idea is to open-circuit the field coils of the motor by the use of a double break key, and pass the current through the primary of the coil or transformer instead, and a series motor must be used for this work, the commutator and armature remaining in circuit.

By the addition of external resistances as wide a range of power can be had as may be desired, and by changing motor speeds a corresponding change in spark note can be had to suit almost anyone. The note will be clear and musical, but it will in most cases be found necessary to use a very short spark gap; but this is what is expected in quench gap work anyway.

Other forms of balance will occur to the radio experimenter. Such devices as cooling fans for gaps, etc. can be used. It

(Concluded on page 47)

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More on Wave Meters

By Nine Zee Vee

THIRTY amateurs at a radio club were asked to state the fundamental wave length of their antennae. Not one could answer. Nor could any of them give the inductance or the capacity of their antennae, and only a few knew the wave length of their transmitters, and that because it had been measured for them at a distant receiving station. It seems that most amateurs adopt the hit-or-miss plan of making their aerials, transmitting condensers, and transmitting inductances of a certain size "because some other amateur used that size". Ask the average amateur the capacity of his transmitting condenser. Nine out of ten don't know. As for decrement—they have a hazy idea of what it means but that's all.

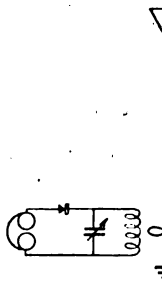


FIG 1

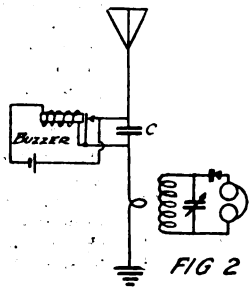


FIG 2

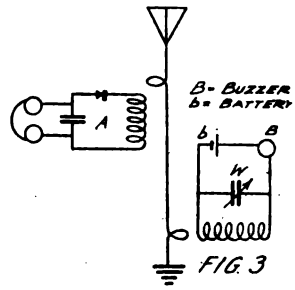


FIG 3

No wonder they named us amateurs.

By the simple and judicious use of a wave meter all of the above values can easily be obtained. A wave meter is just as necessary to the modern amateur set as a V.T. It seems, however, to be regarded by the general radioist as a luxury. The methods of using a wave meter as well as directions for constructing one have been very timely covered by Mr. Pacent in recent QST's; therefore there is no excuse for not having one.

Measurement of the natural wave of an antenna is probably well known to the up to date amateur. However, three methods of exciting the aerial are given in Figs. 1, 2, and 3. A small induction coil is shunted across a gap in the antenna-ground circuit in Fig. 1, while in Fig. 2 a condenser of 1 mfd. capacity replaces the gap and a buzzer replaces the induction coil. The 1 mfd. condenser here used has a large enough capacity with respect to the antenna capacity not to affect the wave length. The wave meter is placed near a loop in the ground, and the reading taken in the usual way. In Fig. 3 the antenna is excited by the wave meter W, A being the detecting circuit.

For the determination of the capacity of an antenna it is necessary to have at hand a variable condenser with either a direct reading capacity scale or provided with a degree-capacity curve. With the circuits arranged as per Fig. 4, vary the wave meter until it is in resonance with circuit A. Now disconnect the aerial and ground leads and connect in their place the variable condenser of known capacity. Leaving the W.M. unchanged, vary C until resonance is obtained. The capacity of C is then the capacity of the antenna. The inductance L must be at least five times the antenna inductance for accurate results. Another method of determining antenna capacity is to first measure the wave length of the aerial alone and then with a condenser of known capacity in series with it. If the two wave lengths do not vary by more than about 20% the aerial capacity can be calculated from the formula

$$C = \frac{C_1 (\lambda^2 - \lambda_1^2)}{\lambda^2}$$

where C=effective capacity of the antenna, C_1=capacity of the series condenser, λ=wave length of the antenna, and λ_1=its wave length with C_1 in series.

Antenna inductance is measured in a similar manner. The wave of the antenna is first measured alone and then with a known inductance in series with it. The formula then becomes

$$L = L_1 \frac{\lambda^2}{\lambda_1^2 - \lambda^2}$$

where L=inductance of antenna, L_1=known inductance, λ=wave length of the antenna alone, and λ_1=its wave with L_1=in series. From the fundamental formula for the natural period of a circuit containing inductance and capacity, (L=

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microheneries, C=microfarads), it is obvious that if the wave length and capacity of an antenna are known the inductance can be determined. Or if the wave length and inductance are known the capacity can be figured. It is a good plan to measure both the inductance and the capacity and then check each by substitution in the formula.

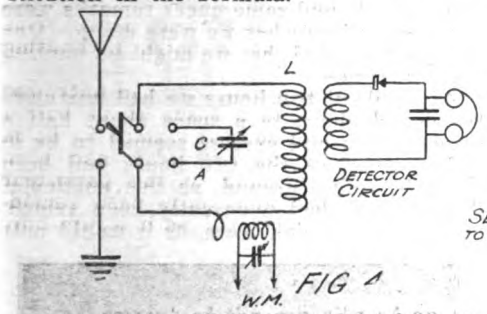


FIG 4

Measurement of the capacity of an unknown condenser also requires, besides the wave meter a variable condenser of known capacity. The circuits may be arranged as in Fig 5. With the D P.D.T. switch thrown so as to include C_x, the unknown capacity, in circuit, vary the inductance L until resonance is obtained. Now throw the DPDT switch over to C, and leaving L unchanged vary C until the circuits are in resonance. The $C_x = C$. This method is known as the substitution method. If the condenser of the wave meter has a capacity scale, a simpler method can be employed, as follows: With the inductance coil of the wave meter placed near some exciting circuit, the wave meter and that circuit are tuned to resonance. After the capacity of the wave meter condenser has been noted, the unknown condenser is connected in parallel with it, and the circuits tuned to resonance again. The capacity of the unknown condenser is then the difference between the first and last readings of the wave meter condenser.

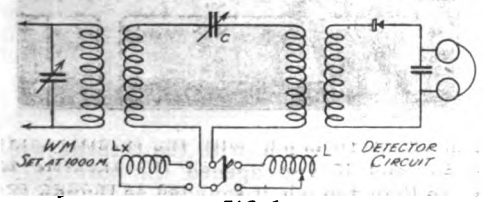


FIG. 6

The method for the determination of the value of an unknown inductance is similar to that employed for the unknown capacity. However, a variable inductance of known values is necessary. It is simpler when measuring inductances to place the unknown inductance in circuit with a known capacity, determine the natural period of the circuit and then by use of the wave length formula calculate the value of the inductance. Fig. 6, however, shows the circuits for the measurement of inductance. With the D.P.D.T. switch thrown so as to include L_x, the unknown inductance, in the circuit, the condenser C is varied until resonance is obtained. L is now thrown into circuit and varied until the resonance point is reached,

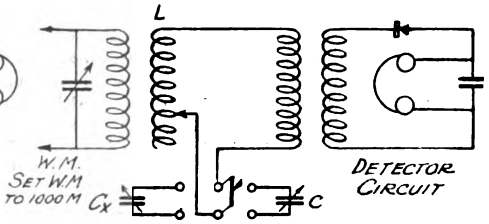


FIG. 5

C of course being left unchanged. The value of L_x is then equal to the value of L.

The tuning of a radio transmitting set to a definite wave has been gone over so many times that it will not be repeated here. The wave of incoming signals at a receiving station may be measured in two ways. If the signals are strong enough the inductance coil of the wave meter may be placed near the primary of the receiving transformer and the wave meter condenser varied until the loudest signals are obtained. A phone and detector are of course used in the wave meter circuit. Weaker signals which cannot be heard with this method may be brought to an exact tune on the receiving transformer, and the wave meter with a buzzer used to excite the former.

The foregoing measurements can be more simply and accurately made by using the oscillating V.T. method shown by Mr. Rawson in the August, 1919, QST. However, few amateurs possess the necessary milliammeter, so the above methods are in more common use. The known condenser required in some of the measurements can very well be the Murdock 43-plate type and the capacity curve shown by Mr. Pacent in the January QST made use of. After the condenser capacity is known it may be included with an inductance in a wave meter circuit and this circuit tuned to a certain wave. By substituting in the formula the known value of λ and that of C, the value of L can be calculated. We then have a known value of inductance by comparison with which further measurements may be made.

MIDWEST CONVENTION
ST. LOUIS
DECEMBER 28 - 29 - 30

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Induction Shooting

By K. E. Hassel*

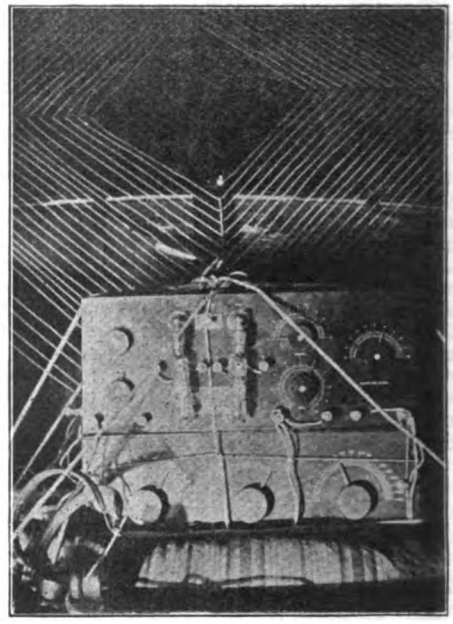
EVER lite up the old pipe, carefully adjust the fones, then flip on the bulb expecting to hear 8ER and be greeted by a roar that would drown out anything less than a 1-KW five miles away? Well, such was the misfortune of more than one station on the north side of Chicago. To spit on the cat wouldn't ease your feelings a bit and I doubt if throwing the cat in the lake would have helped much. Many a nite I reached for the Colt .45 and looked around for something to take it out on. To help matters 9AU would say "DX QSA hr tonite induction nil". Wouldn't that drive a man to Root Beer?

The above will explain why your log shows slight activity on the part of 9ZN for about two weeks, early last spring, before the QRN started up. Honest, OM, we could have rectified that induction and charged our battery with it. There were just three ways of stopping it. First, to ground the antenna; second, to turn out the bulb; and third, to go out and locate the source and apply the Wouff Hong. We used the first two methods for about two weeks; then we got mad and decided to try the third method.

When you start out to locate the source of induction in a city the size of Chicago you feel as if you were going out to find where the QRN comes from. The preparations were as follows: a flivver truck was furnished by Mr. Boettcher of 9KN, and equipped with his recciving set consisting of a C.R.L. Regenerative Receiver, a one-step Amplifigon, and the necessary tubes, batteries, fones, etc. A small loop was made up and connected to the antenna and ground posts of the receiver. The first nite that we got all ready to do or die, the induction never came on; however, the next nite it was as strong as ever and we started out accompanied by Mr. Marco of 9CD.

Just where to begin was a question, but inasmuch as CD seemed to hear it the loudest we began by taking our first reading in front of his house. To our great delight we heard the induction quite distinctly and best of all we obtained a definite direction which happened to be parallel with the street. We then went four blocks west and two blocks south and took another reading. The direction was determined and plotted out on our map. We then circled around, taking readings and plotting the directions on our map, until we had several lines which crossed in an approximate point which happened to be in a fairly live business district. By this time we had attracted the attention of many people and some queer remarks were heard as to just what we were doing. One woman suggested that we might be hunting a lost message.

After about two hours we had narrowed the search down to a space about half a block square and success seemed to be in sight. Most of the two hours had been spent in riding around, as this particular flivver truck had apparently been remodeled to haul freight cars, as it would only



run about 10 m.p.h. with the throttle wide open, and if you opened the throttle to more than 4 m.p.h. it sounded as though the engine was coming out from under the hood. However, even in a flivver you eventually get there and in another half hour we had discovered that a single street lamp had been causing more QRM than 29 boys with spark coils all calling CQ at once.

Now that we had located the culprit the next question was how to apply the Wouff Hong. Several nice bricks were in sight, but so was a cop, so that method had to be abandoned for the time at least. Right then I would have given a good VT for the use of a .22 rifle equipped with one of Mr.

(Concluded on page 47)

* Sales Manager, Chicago Radio Laboratory, and Operator "SF" at 9ZN.

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CU in St. Louis

WELL, O.M., we're all set for that A.R.R.L. Midwest Convention in St. Louis, December 28th, 29th, and 30th. At the rate the Arrangements Committee has been receiving reservations, there will be SOME crowd there, and everything has been lined up to make it a convention that will outclass the Chicago meeting—which means that it will have to come off in great style.

Our President, our Traffic Manager and our Secretary-Editor of course will be there, glad to make the personal acquaintance of you fellows—you didn't think we'd miss being there, did you? It will certainly be great to meet face to face the men we hear in the air and read about. We will all get together and talk over our relay problems, the progress of our organization, how to improve our stations, and we will have lots of fun too, for the Committee has tipped us off to a few of the surprises that are in store for the gang, and we wouldn't miss 'em for a new condenser.

But you'll have to attend the meeting to get the benefit of these things. Every amateur who can possibly get there should feel it a duty and a privilege to be present, and he will leave the meeting a wiser and a happier man. Tell the Arrangements Committee, at 1300 Olive St., St. Louis, that you're coming, and start saving up your shekels. We'll see you there, OM.

The New Call Book

WITH unmitigated joy we greet the appearance of the Department of Commerce's list of radio stations. It surely does seem good to get hold of them again—to know that all one has to do to learn some chap's QRA is to look him up, and not be wondering for months who that particular DX station is.

The list is in the usual form of this publication except that this year it is in two sections, one listing commercial, government, and special amateur stations, and the other the general amateurs. Both lists are necessary to keep in touch with things on the air, and both should be in every amateur's station. Their price is but fifteen cents each. Altho published for the Department of Commerce, the Department does not make the distribution, and orders should be mailed to the Superintendent of Documents, Government Printing Office, Washington, D. C. It should be particularly noted that stamps are not acceptable as a remittance—it should be money order or personal check.

QST adopts the new lists as its standard and will resume the publication of calls commencing where they stop, in each district. If your call does not appear in the book, report it to us and we will publish it.

Take Care!

PROBABLY QST readers noted in the November issue the report of the signals of 7HH in 1HAA's list of "Calls Heard". At 12:15 a.m. on Sept. 24th a station signing this call was distinctly and without a question of doubt heard both by 1HAA and by several amateurs at Station 2VA, Hoboken, N. J. As the signals were none too loud, and swinging with every evidence of it being a distant station, 2VA and 1HAA thought they had hung up some pretty good receiving, and we went after a description of 7HH for publication in QST. We wrote to 7HH and learn that his maximum range was 25 miles, that his station has been dismantled since June, and that it is impossible that it was he whose signals were heard. The call has not be reassigned.

Now who was it? Could it have been an unintentional slip on the part of some other station? 8HH shows a clean slate, none of their operators being in the punk class and their station having confined its activities to experimental phone work during that period. We are therefore regretfully forced to the conclusion that some misguided amateur was maliciously signing false call letters for the express purpose of deluding other amateurs. Perhaps he was close by, and giving some nice

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artificial fading by swinging his oscillation transformer open and shut.

We would like to meet this fellow. Such practices must be stopped at once and for all time. If these lines meet the eyes of the would-be "7HH" let him take them as a warning—that if we can find out who he is we will drive him so far out of Amateur Radio that his call letters will be SOL. Fellows, absolutely this sort of thing can not be permitted in our midst. The A.R.R.L. will not tolerate it an instant and will immediately take steps to bar any amateur guilty of such action from enjoying the privileges which belong to the rest of us as law-abiding citizens. A.R.R.L. Headquarters requests reports of any such instances that come to the notice of its members, and particularly wants to know the QRA of "7HH". Who knows?

QST the World Over

THE other day we received here at Headquarters a subscription to QST and membership in the A.R.R.L. from Prof. Bacon, head of the Physics Department of the American University at Beirut, Syria. Never heard of the place, did you? Well, to tell the truth, neither had we. We know now, however, that it is an American University of over 1,000 students located more than 7,000 miles from the QST Factory, over in what used to be Asiatic Turkey in the bad old days befo' de Wah. They have a radio set in connection with the Physics Department, and find that they need QST to keep abreast of the times! We'll admit it rather took our breath away. Then we started looking up our foreign subscribers, just to satisfy our curiosity as to just what places QST goes to besides the good old U.S.A. Here are a few of them. England and Mexico tie for highest in number of subscribers. Little Honolulu runs a close second, and third comes, who would ever think it, the Flowery Kingdom! Yes, we think that the newspaper dope we read about the awakening of China must have some grains of truth in it, for they are subscribing to QST over there, which you will agree, is a sure sign of scientific progress.

Central and South America, as might be expected, come in for a good share, for we mail copies each month to Argentina, Chile, Costa Rica, Nicaragua, as well as to the British West Indies.

Japan is on our mailing list as well, but we must say that so far China has her beaten in number of subscribers. Probably the Japs, as is their habit, saw a copy of QST and then started out to try and make a Jap imitation to take its place. We'll say it can't be done, fellows. Do you agree with us?

Nor must we forget Mr. Arnar, whose picture you saw in November QST. He holds the frontier line 'way up in Iceland. Says the only thing to keep him warm on a real cold night, about ninety below, is to read an Old Man story. T.O.M.'s language would keep anyone warm!

Isn't there something for us to think about in this? QST is the official organ of a body of amateurs actively working so far only in the United States and Canada. But our fame has spread to the ends of the earth, and we have brothers in radio all over the seven seas. Has not a germ been planted which may in time grow up and bear fruit in a great international organization of amateurs, who will be QSO each other not only "from the rocky coasts of Maine to the sunny slopes of California" but "from Greenland's icy mountains to India's coral strand", as we used to sing in Sunday School. Elsewhere in this issue we publish a letter received by Hugh Robinson, 2QR, Keyport, N. J., from Scotland, telling of the reception of his speech and the enjoyment of his radiophone concert! Who will say that the day is not nearer at hand than many of us think?

QST Ship Operators

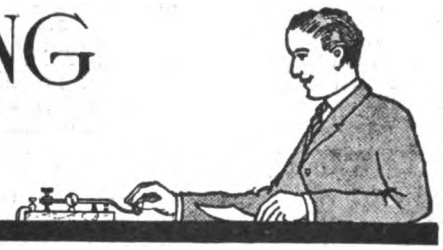
IN the November issue of QST we published an interesting letter from the operator of KOSM reporting amateur signals up to 1300 miles off the Atlantic Coast. And we will not soon forget the splendid letter of Operator Roebuck a few months ago reporting signals that will probably long stand as records for some of our stations.

Can't we have more of this? All of us are interested in knowing how far we are reaching out, and the possibilities of some of us being heard in the China Sea or the Bay of Biscay are not nearly as remote as they used to be. The audibility and the fading at various distances will be interesting, too. Commercial operators who can spare the time to rig up some equipment to get down on short waves and report our signals to QST will do us a great favor, and will themselves find it most interesting to keep tab on the doings in the amateur world back home. And if anyone is particularly ambitious, perhaps we can arrange a schedule for certain of our good stations and get data on swinging and audibility every night until no signals are heard—and so hang up a few new records for miles-per-watt. Will you help us, you commercial ops?

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THE OPERATING DEPARTMENT

F. H. SCHNELL, 1MO
61 Waverly Bldg., Hartford, Conn.
TRAFFIC MANAGER.



WELL, we have paved the way for another rotten Old Man story, as the result of our reception in Hartford of the election returns. Only two stations were readable at times. They were 8ZW and 9ZJ. However, from them we were able to get information that was in the hands of the newspapers in some cases more than two hours ahead of the land wires. That is one thing to be thankful for and another is that we will get many laughs from the O.M. story if he finds this out. What success the other sections had remains to be seen but reports will be had in the January division reports. Rain and induction were the two big issues here in the way of prevention.

Several changes have taken place in the personnel of the Operating Department. Mr. J. C. Cooper, of the East Gulf Division, resigned because of pressure in his business. In his place we have Mr. E. H. Merritt, 192 W. North Ave., Atlanta, Ga. As yet Mr. Merritt is having difficulty in getting good material for relay work, as a careful survey of his report will show. Let's give him a lift, fellows, and report to him any station in that division doing good DX work.

Mr. C. A. Service, Jr., has resigned as he will be out of the Atlantic Division after this month. We have not learned of his destination, but hope he will be available in some other division. Mr. C. H. Stewart, 3ZS, has taken over the duties of the Atlantic Division Manager. Mr. Stewart is located in St. David's, Pa. His report shows that good relay material is needed and as Mr. Stewart is our representative on legislation, it is requested that all amateurs help as much as possible in keeping this division in order, as a legislative representative is a very busy man, indeed.

Fellows, in the Dakota Division we are going to lose Mr. R. H. Pray. On account of ill health he is going to locate in California. If he is able to be of assistance to the west we know that they will benefit greatly, as Mr. Pray has been most successful in his organization work, and to him is due the credit for awakening the amateurs in his part of the country. Mr. Boyd Phelps, 3344 First Avenue South, Minneapolis, Minn. has been appointed Division Manager of the Dakota Division. Mr. Phelps has done much to organize the Twin Cities, and undoubtedly will be a big factor in carrying out the work Mr. Pray has started.

The new appointment certificates of the Operating Department have been mailed to all amateurs holding office in the divisions. If your certificate has not been received, it is your duty to write your Division Manager and see that he has sent your name in. He has been requested to send a list of his personnel. If you are not a member of the A.R.R.L., you need not look for a certificate. Better check yourself up and send your application blank in.

Again—DIVISION REPORTS MUST BE IN THIS OFFICE NOT LATER THAN THE FIRST OF EACH MONTH.

This month's reports follow:

ATLANTIC DIVISION
Chas. H. Stewart, Mgr.

The relay work in this Division, while of considerable volume in the aggregate, is far from satisfactory, and it is fully realized that there is much room for improvement. Considerable perfection of the organized is still necessary if the best results are to be achieved. We are, however, working with this before us, and as soon as we can get the work properly divided and find some more reliable traffic assistants to take some of the burden off the District Superintendents, and as soon as an adequate organization within the Districts can be built up, we are confident that much better results will follow.

So far as Trunk Lines are concerned, they are still unorganized in spite of the best efforts. That is to say, so far it has been apparently impossible to build up a reliable chain of stations with such distances intervening as to insure a workable relay system under average conditions. It has been necessary to rely upon long jumps in many cases, and in this way a considerable number of messages have passed along through the Division.

District Superintendent for Western Pennsylvania, Mr. R. C. Devinney, reports that upwards of 300 messages were handled during the month, mostly by 8ZD, 8DV

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and 8RQ. On Branch Line No. 2 he reports the loss of two stations, 8ADF at New Castle, Pa. and 8UG at Erie, but states that the Erie station will probably be replaced shortly. A station has been located at Vandergrift. The Traffic Assistant (8EN) has received a special station license, and is now using the call letters 8ZD, and has been heard recently quite well in the station of the Division Manager.

Mr. H. M. Walleze, Supt. Central Pennsylvania, reports that he is doing his utmost to get his own station 8BQ reestablished. He states that he is not satisfied with the progress so far made in his District, but he is doing his best to find some way of improving the condition. It is a fact that available stations in his territory are few and far between, and it is a considerable handicap. He has appointed Mr. W. A. Cawley, of Milton, Pa. as his Traffic Assistant.

The Supt. for Eastern Pennsylvania, Mr. S. W. Place, of Norristown, Pa. reports that he is in touch with new stations at Pottstown and Reading, and hopes to get them interested in relay work shortly, and that if the former Pottsville station will only come to life soon, work on Trunk Line B could be carried on in a reliable manner through his District. He also advises that McVicar (3CE) of Norwood expects to return home within a month, and will be of assistance on Trunk Line D to the South of Philadelphia. In this connection it will be noted that 3HJ has been able to work 3HG at Baltimore on several occasions, and as the latter station has been heard quite often recently at my own station, it would seem that the old difficulty of working between the Philadelphia District and Baltimore is on the way towards a solution, although the ideal condition would be to have the gaps shorter for more reliable work. Mr. Roy C. Ehrhardt, old 8CE and now 8ZQ at Dunmore, Pa., has been appointed Traffic Assistant in charge of the northern counties of the Eastern Pennsylvania District.

Mr. R. B. Duvall advises that he is busy working up local matters in Baltimore, and that 3HG is doing excellent work nightly, and that 3IY has started into the game with renewed interest. Both stations have been heard by the Division Manager, which bears out Mr. Duvall's statement. It is certainly very gratifying to see that conditions are improving in this section.

Mr. Francis Baer (3XF) 1744 Corcoran St., Washington, D. C., has been appointed District Superintendent for the District of Columbia, and we can expect a comprehensive report from him by next month of the conditions in that section. All stations in that vicinity should make themselves known to him.

In the absence of a report from the Assistant Division Manager of the Northern Section of the Atlantic Division, I am not in a position to report on conditions in New York and New Jersey.

ROANOKE DIVISION
W. T. Gravely, Mgr.

We are off—the 1920-21 Season is on in full blast, and with it some new records are being made. The air is alive with amateur signals—the deep bassos may be heard booming, (and they are broad, too, usually), the fine rich, resonant tones of those a little higher may be heard pounding in, and on up the scale, until we reach the spark which comes good on the start, and which fades, fades, fades, away as the motor gathers speed (a condition due to the lack of balance between transformer, condenser and gap), and then the CW's, that so called "last word" in radio communication. If one can drop in on a good night and hear all that is going on, and fail to feel as elated as a youngster we will call him an "Oldster".

Reports from 3EN and 3FG, in the Norfolk District, are not very encouraging. They are complaining terribly of the QRM from NAM on 200 meters, which they say, is due to re-radiation. The Division Manager 200 miles away experiences lots of QRM also on 200 from this same source. These stations say they are unable to handle traffic with any consistency until the trouble at NAM is remedied. Let's hope it will be soon.

3HO, C. D. Blair of Richmond, reports progress. His station is on the air now and will soon be in good shape.

Mr. Wohlford, 3CA, Roanoke, reports slow progress in his District, but we hope they will be heard from ere the season has progressed very far.

Mr. Heck, (8EF) Mannington, failed to make any report this month, so we are without information concerning the W. Va. field.

However, 8ZW of Wheeling is being heard far and wide, so we know there is action in the State.

3AEV of Danville will soon be in the air with a 1 K.W. outfit, and will assist the Manager in relay operations at this point. He will conduct tests with the stations in the Division, with the view of mapping out effective lines. Those who are interested will please get in touch with Mr. A. S. Clarke, care Clarke Electric Co., Danville, Va., and arrange for test schedules.

Definite lines will not be created until these have been carried out, because a dead line is worse than no line at all—it demonstrates lack of efficiency, lack of grit and determination.

Word has come from the Radio Club of the University of Virginia, through Mr.

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Sanders its Secretary, to the effect that their station will be in operation at an early date, certainly by the last of November. This station should fit in well on the main Southern route.

Very few new stations are being reported, so there is very little to build on. Therefore, it becomes necessary to perfect those we now have to a higher degree and handle traffic in longer jumps.

The Manager made the acquaintance of Traffic Manager Schnell a few nights ago through the ether with 1AW and 3BZ making the introduction. Communication as clear and as fine as could be desired. It was a genuine hand-clasp, friend Schnell—the Roanoke Division greets you —it is yours to command—we promise you our hearty co-operation.

EAST GULF DIVISION
E. H. Merritt, Mgr.

We are still unable to handle messages in this division due mostly to a lack of stations. Quite a few stations have written in that they are working on their sets and hope soon to have them ready, but even with these the number of stations available for relay work is very small, in fact, too small. I am sure though that if we all keep trying, we can get a route worked up soon. Let every one do his best to help out.

The route within the last few days has been open as far as Savannah but I have not yet had a report of any work being handled that far. We have heard 4YB reaching out, and while he fades badly here, he has been heard working over some remarkable distances. 5XA, Auburn, Ala., can also be heard quite often now but the Atlanta stations have been unable to work him yet. 5XA seems to go nearly every other direction, though 4XC and 4AG are both working and have handled several messages during the month.

The Division Manager has at last located a station in South Carolina, 4EG, Mr. W. C. Etheredge, Woodruff, S. C. 4EG is a new-comer and so far, his spark is unknown over here in Georgia. We will welcome 4EG heartily.

The Asst. Manager reports that he is also unable to locate stations in Alabama.

Mr. O. A. Gulledge of Fort Pierce, Fla., (4AT), has been appointed District Superintendent of Florida. It has been impossible for 4AT to work with stations south of him but they are trying everything possible to put it across to the fellows in Miami. They are trying directional aerials now and are tuning the sets to the highest possible efficiency and expect to make connection soon. 4AT will be able to work north.

The Division Manager again requests that all men in this Division that have not yet written in please get in touch with him at once. Several vacant places in the Division personnel will be filled as soon as men are found to take the jobs. The places we need to fill most are in the Districts of Alabama and South Carolina.

WEST GULF DIVISION
Frank M. Corlett, Mgr.

With more favorable atmospheric conditions prevailing in this section relay work is beginning to assume more business-like regularity. With the actual handling of daily test messages over the Trunk Lines and the heavy message traffic following directly behind these tests will come the information or data on which the Division Manager and his assistants will select the Trunk Line Relay Stations. Trunk Line Relay Stations will be the most efficient set of amateur stations in the Division and station owners should be proud of the distinction of having a Trunk Line Station Appointment in their station.

It is already apparent that a number of changes in the personnel of this Division's Traffic organization will be necessary for the best interests of the League.

District Superintendents and others having correspondence with Division headquarters have no doubt noticed the delay in answering their correspondence. The D. M. has realized for some time that the work of this Division justified the appointment of an assistant. Mr. Raymond L. White, having been transfered from Ennis to Dallas by his firm has been relieved of his duties as District Superintendent of Northern Texas and "promoted" to Assistant Division Manager, with headquarters in Dallas, temporary address General Delivery. Mr. White, besides having charge of the division's correspondence, will "sit in" at 5ZC until his station, 5AP, is again in operation. District Superintendents will report direct to Mr. White. I am sure that correspondence will receive the more prompt attention that it deserves under this new arrangement. Succeeding Mr. White as District Superintendent of Northern Texas District, Mr. H. P. Haeifer 5AJ, has been promoted from City Manager of Dallas to District Superintendent. All Assistant District Superintendents of Northern Texas District will report direct to Mr. Haeifer. A City Manager for Dallas will be announced later.

In the Oklahoma District three appointments of Asst. Dist. Supts., and their Territory assignments have been made. These are; Mr. C. M. Selby, 5BM, 1163 Locust St., Muskogee, Okla., Asst. Dist. Supt., Oklahoma District and assigned the Northeastern Territory comprising the Counties of Washington, Nowata, Craig, Ottawa, Rogers, Mayer, Delaware, Creek,

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Tulsa, Wagner, Cherokee, Adair, Okmulgee, Muskogee, Okfuskee, McIntosch and Sequoyah: Mr. Emanuel Schonwald, 5ZZ, Blackwell, Okla., Asst. Dist. Supt., Oklahoma District and assigned the Northwestern Territory comprising the counties of Osage, Pawnee, Payne, Lincoln, Oklahoma, Logan, Noble, Kay, Grant, Garfield, Kingfisher, Canadian, Blaine, Major, Alfalfa, Woods, Woodward, Dewey, Custer, RogerMills, Ellis, Harper, Beaver, Texas and Cimarron: Mr. M. C. Poor, 5EF, 437 West Grand Ave., McAlester, Okla., Asst. Dist. Supt., Oklahoma District and assigned the Southeastern Territory comprising the counties of Seminole, Hughes, Pittsburgh, Haskell, Latimer, LeFlore, Pontotoc, Coal, Johnson, Atoka, Pushmahata, Marshall, Bryan, Choctaw and McCurtain. All amateur station owners in these respective territories should furnish their respective Asst. Dist. Supt. their name, call letters, and a description of their stations. It is hoped that a District Superintendent for Oklahoma District can be announced in the near future. In the mean time Asst. Dist. Supts. will report direct to the Asst. Div. Mgr. 5ZZ at Blackwell, Okla., will act as Division Terminal Station on Trunk Line Tests, starting a "FOX SOUTH" at 9 o'clock each night and forwarding to the Div. Mgr. all "FOX NORTH" tests received from the South.

Louis Falconi, Dist. Supt. of New Mexico District, announces the appointment of Mr. A. B. Livingood, care Mountain State Tel. & Tel. Co., East Las Vegas, N. M., as Asst. Dist. Supt., New Mexico District, and he has been assigned the East Las Vegas Territory comprising the Counties of Torrence, Guadalupe, Quay, San Miguel, Santa Fe, Taos, Colfax, Mora and Union. Mr. Livingood wants to hear from all amateur stations in his Territory giving names, call letters and descriptions of their stations. 5ZA reports the Southern Transcontinental Relay Route, TRUNK LINE C, open for traffic to the Pacific Coast. Up to October 14th **ten messages have gone thru to the coast either direct or Via 6GE at Douglas Ariz.** Another good station in Doublas which is going to prove helpful in the work to the coast is 6IG operated by H. L. Gooding. Have not heard from our old friend Bob Trump at Phoenix yet. To sum up the Trunk Line situation, New Mexico District will be able to take care of traffic from district boundary to district boundary with ease. Stations in El Paso, East Las Vegas, Clovis and Albuquerque seem slow in getting started but will be with us soon. This "season" is starting in with a bang. At 5ZA a dozen or more Pacific Coast stations are heard nightly. Until a reliable station West of Roswell can be located 5ZA will act as Division Terminal station on tests and will start a "CAST EAST" at 9 o'clock each night, and forward to Div. headquarters all "CAST WEST" tests received from the East.

The situation in the Southern Texas District apparently is unchanged. At Austin, Texas, 5ZU and 5BO are on most every night, QRN or not, until it is seen that QRN is too heavy for relay work. 5EJ at Austin has moved out of the city 5 miles to get away from the dilapidated street car system QRM. College Station now has a 150 watt aeroplane transmitter, 500 cycle set, which is far easier to copy than the 2 K.W. 60 cycle which they also have. 5ZN, Ed Nettleton, Eagle Pass. Texas, is heard breaking thru every once in a while. Austin and Houston stations have the greatest difficulty working each other lately, while either can work Kansas and Missouri stations with apparent ease. Mr. Wall is erecting a station in San Antonio, regenerative receiver, ½ K.W. Quenched Gap transmitter. This should be able to work around WUJ, the Army station, without interference. At last a San Antonio station! With E. A. Sahm and Harry Hans in New Braunfelds with a good station we should be able to work thru to San Antonio most any time. Mr. Daniels, 5AO, Asst. Dist. Supt. in charge of Houston Territory, reports Houston started off with a bang the first good night with 5DH, 5ZV, 5AO, 5CA, 5HE, 5AE, 5YI, 5XD, 5ZAC, 5ZT, 5JO, 5JK, 5JM in commission and other licenses on the way. The Southern end of Line F and the Eastern end on Line C will be well taken care of in Houston. Each station should be assigned some definite work to do and then do that one thing well. There is room for all good stations and still be plenty of work for ea h to do. The more stations the more there will be to do. Houston stations report that 5ZC, the division headquarters station, "fades" very bad. Signals between Houston and Dallas have always faded more or less and practical relay work, direct, between these points has never been done with any degree of satisfaction.

At one of the largest meetings of the Houston Radio Club, all officers of the last term were re-elected to succeed themselves. Lectures on radio theory will be resumed with the next meeting and will be given every two weeks through the season, the speaker to be chosen by the directors.

Some very good records have been made on transmission by 5AO, his signals having been reported QSA with very little QSS from New York 1435 miles, Philadelphia 1350 miles, while time signals have been reported by Elgin, Ill.; Clinton, Iowa; Hammond, Ind.; and Louisville, Ky. A 1 K.W. Thordarson and home-made semi-quenched gap are used.

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Mr. H. P. Haeifer, 5AJ, newly appointed Dist. Supt. for Northern Texas District, reports radio activities becoming more promising daily. Asst. Dist. Supts., Pierce of Corsicana and Clyde Mosteller of Pilot Point reports have not been received. Assistants' reports should reach me promptly and regularly. In the Greenville Territory there are at least four dependable relay stations, 5IS, Frank Cain; 5DW, Dave Oblewitch; and Zeke Butcher, 5AL, of Greenville; 5HV, Arthur West of Commerce. 5CL, James F. Burnes of Marshall, has just been heard in the air. Amarillo Territory is progressing nicely under Asst. Dist. Supt. Martin, in the way of numerical strength. Henry M. Harris of the Waco Territory reports the Waco Hertzian Society is bending every effort to get their station at Hill's Business College going. We need this station or some station in Waco very badly on Line "F". 5GG, Fay Welden of McGregor is heard quite frequently. Harris says A. & M. College, Rice Institute, and Texas University are being heard in Waco. One of the operators at Texas U is Mr. Gordon White, formerly of Waco.

Come on, fellows lets get Ft. Worth on the radio map; get together and organize a Radio Club. It can be done with a very little effort. 5CG, Marion Apple, McKinney, Texas is doing good work and will no doubt land an appointment on a Trunk Line soon.

October 8th was an unusually good night in this section and it was possible to run tests on Trunk Line "F" both ways to and from Valley City, N. D. to Dallas, Texas. The Line South from Dallas was also in good working order that night so really Line "F" was complete. terminal to terminal. Several days previous to this a test message was started north from Dallas and on this night the test was returned Via 9ZX, 9PI, 9LR, 5ZC. The test north was the same except that 5ZC gave it to 5CD and 5CD to 9LR. After 9LR gave 5ZC the south-bound test he remarked that he had worked 9ZX direct that night so congratulations were exchanged between 9ZX and 5ZC via 9LR. Later with the help of 9LR. 9ZX and 5ZC worked direct for a few minutes.

MIDWEST DIVISION

L. A. Benson, Mgr.

Announcement! The Division Manager invites the Radio World to the first Midwest A.R.R.L. Convention to be held in St. Louis, Mo. Dec. 28th, 29th and 30th, three big days.

This invitation is extended to all brother radio men in this and all the other Divisions for the sole purpose of being favored by your presence at this, the most important undertaking in our entire radio history.

The main purpose of this convention is to bring together the radio men from every Division if possible, to discuss radio in general and to shake hands with the many men with whom you have worked by radio but have never seen.

Speakers of prominence will address the visitors, and many vital factors will be discussed. Plans for the betterment of amateur radio will be formulated. It is proposed to make the convention an annual affair. We have many surprises in store for you and it is to your own advantage that you favor us with your presence. If you are a real radio man, if you have radio at heart, if you want to know how good the radio game really is—then by all means come to this Convention.

The Committee on arrangements will provide hotel accomodations—the radio men in St. Louis can accomodate several hundred at their homes. A banquet, "the kind that's different", a radio ball, contests for which elaborate radio apparatus will be awarded as prizes, and many other social features will be a part of the affair. You miss the biggest event in the history of your radio career if you miss this convention. For the good of the game and as a member of the A.R.R.L. give this the widest publicity possible, tell every one of your radio friends about it. Announce it "via radio" from your station.

9JA reports a personal letter addressed to each operator of a licensed radio station thruout the state brought forth very gratifying results and we have discovered many stations which will be of use this winter. Accordingly the stations who are out of commission have been taken off the routes and these new stations substituted. 9ZQ has worked 9ZJ at Indianapolis several times.

In the west a number of good stations have been located and 9AEQ is coming right to the front. 9ZU and 9FZ show promise in the northwest and 9MS seems to be the standby for the Davenport section. At Des Moines there are several good stations. The Burlington Club has promised to take care of the southeast and with 9CS, 9DT, and 9ZQ in the northeast we feel that we can get traffic thru at any time and to any part of the state.

The central portion is well covered with a number of good stations whose calls it is not necessary to mention here.

9HT reports "DX" has started and stations are pounding in. Considerable fading has been noticed during the past two weeks.

All stations in this district are showing extreme interest in traffic handling and many new stations are in operation.

9XT, Mr. H. H. Smith of Lincoln, now has his station in operation, and with 9UQ is successfully handling all traffic in that direction.

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A station is badly needed in the northern section of this district.

It may be of interest to report that all fading recorded here is from stations north or south.

9KO reports a daylight route to Kansas City, Mo., has been perfected. 9ABI of Columbia, Mo., has proven a valuable station along this route. The route is as follows: 9KO to 9AJN to 9ABI to 9AOJ to 9DU to 9RP. These are all short jumps and communication is almost certain thru any QRN or QRM.

9DU is back in the game again but is having the usual trouble with the power company. He reports conditions in his territory the best ever and many new routes are now under construction.

DAKOTA DIVISION
R. H. Pray, Mgr.

Radio has been increasing in this division and relay work has been going on consistently. The trunk lines A and G are both handling traffic, A going via 9AJI, 9PN and 9OE in Duluth and Superior, to 9ZC or 9ZX (alternate 9WU) to 7IM at Billings, Montana. Traffic also has gone via 9ZT and 9HM in Minneapolis and St. Paul so that route is assured as far as 7IM, 7IM working west to 7CC and 7CU. Trunk line G has handled a message from Valley City, 9ZX, to Dallas, 5ZC, and an answer back to Valley City in half an hour.

Mr. Boyd Phelps, 9ZT, Superintendent of Southern Minnesota, has been giving talks to the various radio clubs in Minneapolis and St. Paul and reports great interest in the A.R.R.L. has been awakened. The amateurs of the Twin Cities evidently knew nothing about the principles of the A.R.R.L. and when they found that the A.R.R.L. is THE AMATEUR, the clamor for application blanks was so great that a supply had to be rushed from Hartford. Two of the clubs have been approved by the traffic officials of the Division and their applications for affiliation are now pending with the Board of Direction. It seems that that Twin Cities are in a fair way to take a place with the other cities of the middle west such as Chicago and St. Louis. The amateur radio activities of combined Minneapolis and St. Paul are under the control of the Twin Cities Executive Radio Council, which is much the same as the Chicago Plan. Consequently there is very little local QRM. Mr. H. R. Hall, 23 Merriam Place, St. Paul, has been appointed City Manager of St. Paul.

In the Southern Minnesota section outside of St. Paul and Minneapolis, stations are beginning to appear.

In the District of Northern Minnesota Mr. Gjelhaug, 9ZC, Superintendent, reports most of the news is from the Twin Ports, where Mr. Bridges, Assistant District Supt., and Mr. Wagner, 9EA, City Manager of Duluth, are working hard at organization. In Duluth there are now 9EA and 9AJI handling traffic, and in Superior are 9EO, 9MX and 9PN all working DX.

All in all, A.R.R.L. work of all kinds is shaping up much better this season than last and with co-operation from all members in the Division the Dakota Division should be one of the best for traffic handling. But there must be co-operation, which means that every one with any kind of station should get in touch with their District Superintendent. A list of officers will be found in the October QST.

ROCKY MOUNTAIN DIVISION
M. S. Andelin, Mgr.

Radio activities are commencing with renewed vigor. All old operators are back on the job with improved sets and ideas. Mr. I. J. Kaar, Assistant Division Manager, has returned from the coast and reports as follows:

"Things look good up this way in the line of radio. I am putting up a 70 foot mast so that I will be able to work with greater efficiency on 300 meters. 6OT, Mr. Berry, can work the coast and will stand by for traffic. Mr. Seely, 540 So. 9th East, Salt Lake City, is installing a continuous wave set for relay work.

"I intend to have the Colorado Wireless Association station at Denver act as relay station on trunk line "B" which runs as follows: 9JE Colorado Springs, or CWA Denver; 6ZA Salt Lake City, or 6ZH and 6JT Richfield, and link up with Central and Pacific Divisions on either side. Also a branch line will run from New Mexico up into Wyoming.

"Mr. W. C. Thompson of Richfield, 6ZH, has installed a 1 K.W. transmitter and is working on 300 meters.

"I wish to locate some good stations in Wyoming. Any one there desiring to get in the relay game please write or wireless me at Richfield, Utah."

NORTHWESTERN DIVISION
John D. Hertz, Mgr.

Now that we are entering the active winter season, we believe it well that all in the Division should know "who's who". Accordingly we present a revised list of Division officers. Several additions and a change or two will be noted.

D. M., John D. Hertz, 7ZB, Portland, Oregon. (Mail address, Box 873, Vancouver, Wash.)

Asst. D. M., Earl Dawes, 7ZD, Box 336, Bozeman, Montana.

Asst. D. M., Royal Mumford, 7ZJ, Vancouver, Wash.

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D. S., Wilfred Slauson, 7ZG, Bear Creek, Montana.
D. S., L. L. Stanley, 7DJ, 320 State St., Helena, Montana.
D. S., F. F. Grey, 7FL, c/o Grey Machine Shops, Butte, Montana.
D. S., Jack Woodworth, 7CC, 170 Almon St., Moscow, Idaho.
D. S., Currie N. Teed, 7FT, Kuna, Idaho.
D. S., Howard F. Mason, 7BK, 3335 33rd Ave. S., Seattle, Wash.
D. S., Miss Winifred E. Dow, 7CB, 2329 South K. St., Tacoma, Wash.
D. S., Olfan DeGuire, 7CW, Silverton, Oregon.
D. S., P. W. Dann, 7JP, Box 974, Astoria, Oregon.

We take pleasure in announcing the appointment of Miss Dow as District superintendent at Tacoma. Miss Dow is a prewar amateur, and needs no introduction on this coast. She is an enthusiastic DX operator, and is credited with having constructed a great deal of her apparatus.

New territory has been opened in this Division at the mouth of the Columbia. Mr. P. W. Dann is the first there to establish communication with "the outside world". He has been appointed District Superintendent at Astoria. Communications to him should be addressed Box 974, Astoria, Oregon.

With the change in weather we notice another curious freak, it becoming more and more apparent as the weather gets "better". It seems that during the summer months the stations in Seattle and Portland have comparatively little trouble working each other, but with the coming of fall, communication between these points falls off almost entirely, while stations in both of these districts carry on satisfactory communication with sixth district stations. It has reached the point where the Portland boys are complaining that the Seattle stations are never on the job, yet we get letters from Seattle inquiring why no one in Portland is ever on.

The trans-continental route "A" has been open only irregularly. The boys on this side of the mountains say this is due to the fact that 7IM is on only occasionally.

We are greatly interested in the fact that communication is now open from Seattle to Everett, Wash. This is another step towards the Canadian border.

A Columbia River Route is being developed. At present this lines up as follows: Astoria, 7JP; Kelso, 7BV; Portland, 7BP, 7DA, 7DS; Vancouver, Wash., 7FH; Pullman, 7BQ; Moscow, 7CC; Spokane, ??. This is practically a daylight route from Astoria to Portland. This will probably go via any Portland or Vancouver station to 7BV, to some station in Chehalis or Centralia, to 7YS, to 7CE, 7CB, or 7BC, to 7AD, 7BK or 7AN. Every attempt will be made to locate the missing link between 7BV and 7YS. Salem and Silverton are also among the workable places from Portland during daylight.

The early part of the month was marked by the erection and maintenance of station "SF" at the Oregon State Fair, Salem, by the Northwestern Radio Association of Portland. Apparatus for this station was loaned by members of the Association, and included material for the erection of a 1 K.W. non-synchronous rotary spark set, used in conjunction with a short wave regenerative receiver and two stage amplifier. A transmitting wave of 260 meters was used by special authorization from our friend, Radio Inspector Redfern. The station complete was installed during three days prior to opening by the club engineers. Stations in all parts of the sixth and seventh districts were worked, and among others, 9WT was heard. Conversation on the Los Angeles-Avalon radio-phone circuit was heard regularly. The whole undertaking was pronounced a great success, and this success is attributed chiefly to the backing of the Northwestern Radio Association. It takes a radio club to put real things over the top, boys.

Mason, reporting from Seattle says: "Portland stations are heard here but seldom now. Even 7CW has faded out and is only heard occasionally. 7AD says he has not heard 7CU for three weeks. Sixth district stations are coming in better now than they did a month ago, 6BN, 6BJ, 6QR, 6EJ, 6FE, and 6AK being among the steadiest. Mr. Brott, 7AD, recently worked 6BJ direct, which is good work indeed.

"There is an increasing amount of small town stuff going on in Seattle. It looks as if two or three good stations will develop before long. 7IY on Vashon Island, about ten miles southwest of Seattle is heard here very strong, and he has worked 7FO of Everett, Wash., who does not seem to hear Seattle stations very well."

Miss Dow reports for Tacoma and vicinity: "Northwestern Washington claims a new record. On September twenty-second 7YS was copied by 9OE of Wichita, Kansas, a distance of approximately 1500 miles.

"We are rejoicing over the return of ex-7LV, Al Stenso, who was in the Navy during the war. Al has always been an ardent relayer, and this winter we'll hear some mighty fine work from him."

We heard our first Canadian station here a short time ago.

In Portland the following stations have been working. 7DA, 7BP, 7DS, 7DP,

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7ZI. 7ZI boasts of working 6JD, (885 miles), from two A.M. till five A.M. one morning. Traffic from Portland goes south without trouble, occasionally east, but northward it is forced to go via USM, at present.

The D.M.'s station, 7ZB, is scheduled to be back on the job by the first of November. A fan antenna is going up, and a counterpoise is under construction. Working waves 375, and possibly 275, will be used, with a calling wave of 200 meters. For local work CW will be used on 150, 175 and 200 meters.

ONTARIO DIVISION
A. H. K. Russell

October has witnessed the revival of life in the Ontario Division, and progress has been most satisfactory.

In the early part of the past month, the Manager made a visit to a newly erected station in Niagara Falls, N. Y., and from there held a very satisfactory conversation both by I.C.W. and radiophone with station 3BP, that of Mr. E. Rogers in Toronto, the Niagara Falls part of the talk being supplied with a half kilowatt transmitter, spark type. As Mr. Rogers' signals have already been copied QSA in Buffalo and Brantford, he appears to furnish a reliable outlet for south and west bound traffic.

The station of the Manager has had some remarkable C.W. results considering that the radiation was approximately one-tenth of an ampere with a high voltage battery of flashlight cells giving about 250 volts. Signals from the radiophone in this station have been copied in Guelph and Kitchener, 40 and 60 miles from Toronto respectively. There are now over half a dozen C.W. stations of low power in Toronto. It is hoped that 3AB will have a medium powered CW and phone set working by some time before the New Year, with a range of a couple of hundred miles.

The District Superintendent of the Brantford district reports that things look extremely well in his territory, and he hopes shortly to be able to report communication established with both Toronto and Windsor, thus furnishing the connecting link for west bound traffic. Lack of a powerful transmitting set has so far kept Brantford off the DX map. In any case traffic to and from Toronto may now be relayed through by way of Niagara Falls or Buffalo.

Mr. Carter, the Windsor Superintendent, advises that relay work is going on well in his district, and his own station 3DH has a range of at least 250 miles, and quite recently his signals have been copied on a single bulb in Toronto.

East of Toronto, and to the North, there seems to be little hope that through communication will be established for some time, particularly in the latter direction. Mr. Lloyd at Sault Ste. Marie advise that several power stations have been erected but at present their traffic outlet appears to be down through Northern Michigan, particularly through KUXM or 8AID in Cheboygan.

Some promising receiving results are reported from Belleville, but nothing is known of the transmitting stations between here and Montreal, as the amateurs in this region seem to be shrinking violets, and refuse to let the Division Manager hear anything about them.

DELTA DIVISION
J. M. Clayton, Mgr.

After practically five months of closed season in the South it is gratifying to hear 'em roll in.

Mr. Paul E. Greenlaw has resigned as Assistant Division Manager of the Division and has been appointed Traffic Manager.

Mr. Hubert E. deBen, 5ZP of New Orleans, has been appointed Assistant Division Manager of the Division. Mr. deBen reports that Louisiana is sorely in need of DX stations.

Mr. Barrow, 5EA has been appointed District Superintendent of the state of Louisiana.

W. E. Anthony, 5ZS, of Shreveport has been appointed City Manager of Shreveport. Anthony is one of the old timers at the relaying game, having run 5ZS before the war.

New Orleans is overflowing with enthusiasm and interest, in fact so much so that some young hopefuls sit at their "wave-minus" sets and practice the code until late hours.

At present 5ZP is handling all traffic for the state of Louisiana. So far this month 56 messages have been handled by Mr. deBen.

Mr. Hutcheson, 5DA, Superintendent of the State of Tennessee, has been going quite a bit of DX work since October.

5YH fulfills what his "summer spark" predicted—a long-reaching whizz-bang of a noise. He has been kept busy clearing the old hook only to have 'em pile up on him again. This month he has handled (QSRed) 88 messages. 5YH has worked with 2RK, 3BZ, 9XM, 4XC and the rest of the DX fellows who pound in this way.

The Division Manager has at last succeeded in hashing together another station.

During the month of October 5ZL has relayed 148 messages.

Traffic going south is being cleared thru 5ZP mostly; however, quite a few have been handled thru 5DW and an occasional one to 5ZC.

Northbound traffic has no trouble in

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getting away. It can go thru 9KV, 9LC, 9ABI, 9ZN, 8DI, or any of the midwest stations.

Westbound traffic is being cleared thru 5ZA as usual. 5ZA pounds in like a ton of brick all over the division and seems able to work just anyone he wants to.

Mid-West traffic has been handled thru 9LR and 9ABI but these seem to be a dearth of stations west of 9LR. Where is Kansas City this season?

The Delta Division A.R.R.L. QSS Tests start on November the 4th and will last all November. Tests will be sent every Tuesday and Thursday night by the following:

5ZL, 5ZP, 5YM, 5ZC and 5YE. While 5ZC is not in the Delta Division he has kindly consented to take the place of 5DA who will be unable to take part in the tests..

Twenty-five recorders have been selected in an approximate "double circle" around the transmitters. These recorders have been supplied with QSS forms. Each form bears the call of the recording station, the call of the transmitter and the date. They are arranged consecutively as to dates and order of transmission for each test night. The recorder merely notes the QSS and signs his name to each sheet.

It is hoped that the southern stations can show up infinitely better in these tests that they did in the summer series. In this connection I would like to point out that no better luck will be had this time unless we have far far better co-operation from one or two "roof raisers" down south than we did in the Bureau of Standards-A.R.R.L. tests just over. We hope some of these fellows will realize that by one thoughtless call during a test they can undo a mighty lot of work that some of the rest of us have put forth.

ST. LAWRENCE DIVISION
A. J. Lorimer, Mgr.

The past few months have been without any marked activity in this division.

The closing of navigation is not far off and we are looking forward to the return to transmission on 200 meters.

We are a little doubtful regarding our northern route to Quebec, having heard little or nothing from our northern stations since last season. 2BJ at Three Rivers used to work Montreal stations quite regularly but has not been heard from all summer.

2CI (3Z) at Farnham has been working every Saturday night for the past month and succeeded in getting some traffic thru to 1HAA and QSRed some to 2AK at Montreal.

Stations 2AK, 2CK, 2CL, 2AW are making good headway and may be handling traffic from Montreal to 8BB at Plattsburgh, N. Y. 8BB is the nearest U. S. station and seems to carry well to the south. When this station sets an operating schedule we will arrange a similar schedule here and route our traffic thru Plattsburgh.

1RAY, Burlington, Vermont, is being heard here but is QRZ most of the time.

NEW ENGLAND DIVISION
Guy R. Entwistle, Mgr.

The recent convention at Worcester brought out the following points:

1. New England has the stations.
2. These stations are successful in relaying.
3. The greatest difficulty experienced is to get the stations on at the proper time.

Thus far, only occasional messages filter thru. The writer has received several messages from New York indicating that a relay must exist, but the time taken for these messages in transit is altogether too long.

Mr. Fred A. Blethen has been appointed Traffic Assistant and has assisted the D .M. in formulating three main routes thru New England for both east and west bound traffic from New York, Boston, Portland, Montreal and the interior. These will be published at a later date, although copies may be obtained by writing the D. M. of the New England Division.

Certain evenings of the week are assigned to each man; also, definite hours of these evenings, thus limiting the time necessary to devote to actual relay work. In this way we feel that more amateurs will be willing to co-operate with us in the relaying of citizen's radio messages.

The Executive Committee of Greater Boston was called together shortly after the Worcester Convention, and the following regulations are to be upheld in this district:

Time divisions—6 A.M. to 6 P.M. free air, permitting opportunity for testing, tuning, code practice, chewing the rag, etc. 6 P.M. to 7 P.M., collecting of local relay traffic and short distance relays. This will give an opportunity to those not yet included in the main line routes to break in to the relay game and also get a line on their transmitting distances. 7 P.M. to 10 P.M., general work, working with one another, no relaying, no tuning and no testing. 10 P.M., all local work stops, long distance relay men check up their clocks by Arlington and start off and begin their regular schedules as indicated on the schedule sheets mailed to the various stations included in the relay. It is important that we all have the same time, as in many cases a station is limited to only fifteen minutes per evening. From 10 P.M. on will be devoted entirely to

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main line relays and long distance relays.

By this time division everybody has an equal chance to do his own particular kind of work, and by a gentlemen's agreement results will be accomplished which cannot be brought about in any other way.

A Vigilance Committee has been selected to report local offenders, both as to willful QRM, failure to respect time schedules, and those with too great a wave length, spark coil transmitters using plain aerial, and the like. The D. M. has been promised the co-operation of local Radio Inspector Charles Kolster, in closing down offending stations.

Mr. P. J. Furlong, 6 Glenside Avenue, Jamaica Plain, Mass., has been appointed City Manager.

1DY has replaced 1BH as D. S. of Northern Massachusetts. Mr. J. C. Randall, 1NAQ, has been appointed D. S. of the Hartford, Connecticut, section. A. D. Ms. are re-appointed for another year.

Amateurs wishing to be included on trunk line relays should send the following information to the D. M.

1. Evenings and time of evening after 10 P.M. you are on.
2. First district stations you hear.
3. First district station you WORK.

With this information the Traffic Assistant can determine the possibility of additional men being placed in the relay chain.

CENTRAL DIVISION
R. H. G. Mathews, Mgr.

During the month of October the winter relay season has fallen into its regular stride and greater quantities of traffic are being handled than even during last winter's long distance season. In order to facilitate both traffic and organization work, several changes have been made in the Division, the most important of these being the division of the state of Ohio into three Districts, to be known as the Miami Valley District, Toledo District and Eastern Ohio District. The boundaries of these districts are as follows: Toledo District—Enclosed by the outer boundaries of and including the counties of Van Wert, Allen, Hardin, Marion, Delaware, Licking, Knox, Ashland and Lorain. Miami Valley District to be enclosed by the outer boundaries of and including the counties of Mercier, Auglaize, Logan, Huron, Franklin, Pickaway, Ross, Pike and Sciota. District of Eastern Ohio to be bounded by the outer boundaries of and including the counties of Cuyahoga, Medina, Wayne, Holmes, Coshocton, Muskingum, Perry, Fairfield, Hocking, Benton, Jackson and Lawrence. The District Superintendents of these new Districts are as follows: Toledo District, Mr. K. A. Duerk, 8ZY, 600 Wilhelm St., Defiance, Ohio; Miami Valley District, Mr. and Mrs. Chas. Candler, 8ZL, 105 S. Ash St., St. Marys, Ohio; District of Eastern Ohio, Mr. A. J. Manning, 8ZG, 252 McKinley Ave., Salem, Ohio. Mr. Robert Higgy of 8IK, Columbus, Ohio, formerly assistant to Mr. Duerk, has been appointed Assistant District Superintendent of the Miami Valley District under 8ZL, because of the fact that Columbus, Ohio, is now included in that District. Note: 8ER has been changed to 8ZL. Mr. Henry Klaus of 9AK has been appointed District Supt. of Illinois, with Mr. E. G. Cunningham, 9AP, Champaign, Illinois and Mr. Ivan Frane, 9AQW, Eureka, Illinois, as assistants. Mr. Klaus is taking up the organization of his District where Mr. Taylor stopped, and expects to run a test over the new Chicago-St. Louis short distance route very soon.

The regular Sunday schedule of the Lake Shore Route, under Mr. Burhop, has been resumed with gratifying success. This route is a sure outlet from Chicago to Wisconsin and Minnesota towns, as well as to Canada and to the Northwest coast. In addition to his organization work, Mr. Burhop has been very active of late in increasing the A.R.R.L. membership. Mr. Melvin Herman, 9FN, 1419 S. 9th St., Sheboygan, Wisc., has been appointed Assistant District Superintendent for Wisconsin under Mr. Burhop and is undertaking, as his first assignment, the operation of the Madison branch of the Lake Shore route.

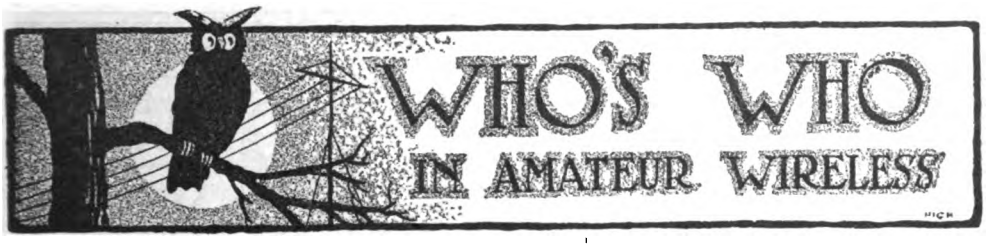
Although the District of Michigan was not very active during the summer months, it has returned to its normal condition and traffic is being handled as during the last season. Mr. C. E. Darr, the District Superintendent, has secured as Assistant District Superintendent Mr. Norman Schlaak, 405 Knox St., Birmingham, Michigan, who is assisting in the formation of routes and organization of club work.

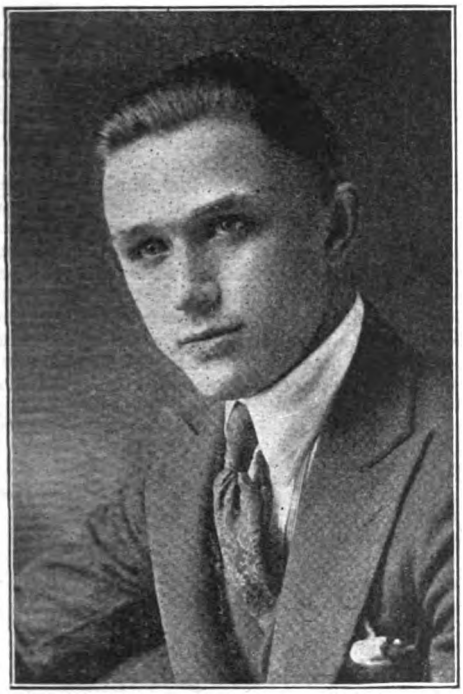
Mr. Holst of 9BG, Chicago City Manager, is proving himself worthy of his position. Meetings of the Chicago Executive Council have been held at intervals of two weeks, and because of the absence of the Radio Inspector at Chicago, due to the transfer of Mr. Kolster, the Executive Council has had the job of regulating interference and in general enforcing the regulations. Its success along these lines has been very gratifying, which is due primarily to the co-operation of the various club members.

Traffic through Chicago is being handled in even better shape that ever before because of the number of long distance stations now able to handle traffic in this city. Among these we wish to express our appreciation especially to 9AU, whose operators Mr. Zeller and Mr. Sholtes have

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L. A. BENSON

This will serve to introduce the operator of 9KV, better known as "Benny".

Benson was born in 1898 in St. Louis, where he has always lived. The well-known radio bug got in its work on him at the age of 14, and of course it never heals. He has operated several amateur sets, his pre-war amateur station being prominent in amateur affairs in the middle west before the war. He has also taken his crack at commercial operating, serving with the Marconi Co. on several lake boats in 1917, and during the war was a radio instructor at Camp Pike, Ark. He is now Manager of the Midwest Division of our A.R.R.L., which he says is the best job of all, and his present station, 9KV, is doing record work.

"Benny" is holding a sheet in his hand but we don't dare show it. Is

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LOUIS FALCONI

Mr. Falconi, 5ZA, Roswell, New Mexico, is the man who put thru our coast-to-coast traffic last year. His well-known spark is a vital link in our chain, and we are glad to know him better thru the pages of QST.

He was born in Italy, March 25, 1895. Hearing of the wonders of America, the family moved to the United States and located at Portsmouth, Va., where LF lived until seventeen years old. He became interested in radio in 1911 upon reading in "Electrician and Mechanic" directions on "How to Make a Detector", and "the bug" did its work well, for he has been a firm radio bug ever since. In 1912 he installed a ½ K.W. set with the call 3HU and tried in vain to cover the seven miles to Norfolk. In the latter part of 1913, while about to graduate from high school, the position of

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WITH THE AFFILIATED CLUBS

"Live Wire" Radio Club
AFFILIATED WITH THE A·R·R·L·

NOTICE

It has been brought to our attention that several clubs either contemplating affiliation or perhaps having actually adopted a resolution making application for the same, are using stationery bearing the statement "Affiliated with the A.R.R.L." This can not be permitted. Affiliation means the establishment of a bond of brotherliness, and this cannot be completed until the League acts on the applications. Formal ratification by our Board of Direction is necessary, and generally about two months are required to accomplish an affiliation. Clubs should refrain from announcing their affiliation until they are advised that formal action has been taken and that their charter is being prepared, and A.R.R.L. members are urged to use their influence to prevent such misconstructions of the nature of affiliation in clubs to which they belong.

The Secretary will gladly communicate with clubs interested in becoming affiliated with the League.



New England Conference at Worcester, Oct. 31.

New England Conference

The annual conference of the A.R.R.L. New England Division relay officials was held at the Hotel Warren, Worcester, Mass., Sunday afternoon, Oct. 31st, with Mr. G. R. Entwistle, Division Manager, presiding, and about seventy relay men in attendance.

After a Dutch-treat dinner at 1 p.m., short business talks were made by President H. P. Maxim, Secretary K. B. Warner, Asst. Division Manager H. Castner. Traffic Manager F. H. Schnell, and District Superintendent Lee A. Bates were the principal speakers. The purpose of the meeting was the improvement of relay work along the line from New York to Portland, Me. There are several gaps in the line, general conditions requiring stations at close distances for reliable work, and the meeting was largely devoted to clearing these up. The meeting was thrown open to general discussion of the problems, everyone was asked whom he could work, reports were had on new stations in missing towns, and the data pieced together. Amateurs were present from Bridgeport to Portland and from Fall River to Vermont, and thru this get-together meeting a vast improvement in relay operation is expected. Daylight tests along a route from Bridgeport to Portland thru stations represented at the meeting, were arranged.

This business meeting is an annual affair, and Springfield, Mass. was chosen as the place for next year's conference. Representatives were present from M.I.T.,

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Harvard, Dartmouth, Tufts, Brown, Essex County, Cumberland County, Lowell, and Brookline radio associations, who, speaking for their entire memberships, added much to the value of the meeting.

The success of this year's meeting was largely made possible by the hard work of District Supt. Lee A. Bates, 1GY, of Worcester. We thank you, 1GY.

Chicago Executive Council

QST has mentioned "Grid Leak", the monthly organ of the Chicago Executive Council. It is growing, and is a fine, interesting little paper. In its general composition and printing it offers valuable suggestions to other clubs contemplating the publication of a paper, and we urge that they get a copy, which may be done by addressing the editor, Mr. N. E. Wunderlich, 4533 No. Sawyer Ave., Chicago.

Of particular interest to us is a warning to violators of the Chicago traffic regulations, with their call letters and offenses published in full. F.B.! It is not pleasant to see one's name held up to six hundred of one's fellow amateurs as a law-breaker, and this publicity will probably result in so reducing the violations as to make this space in Grid Leak available for more pleasant topics.

The October issue also contained 1 genuine T.O.M. story, short tho it was.

Baltimore Club Paper

A good radio club in Baltimore, Md., (affiliated with the A.R.R.L.) has hit upon a very good idea for increasing its membership and furthering the interest in radio matters by publishing a club paper, which we learn is called "The Radio Condenser".

The first issue was distributed Nov. 1st and contained some very interesting local news, besides a few articles on radio by some members. The paper has a wide scope, covering personal news items, technical dope, a Traffic Department, and other subjects interesting to amateurs in Baltimore and vicinity.

St. Louis Radio Assn.

The St. Louis Radio Assn., with fifty members, was recently reorganized and affiliated with the A.R.R.L., and now holds meetings every Friday evening from 8 to 10:30, to which anyone interested in radio is welcome. The present quarters are in the Y.M.C.A., but the club expects soon to have quarters of its own. This association is fortunate in having among its members a number of the older heads in the game, who give instructive and interesting talks at the meetings. Code practice is also a regular feature.

The Secretary, Mr. J. A. Fritz, is very desirous of hearing from other clubs.

South Side Radio Assn.

The South Side Radio Association, of Chicago, Ill., now has a wave meter of standard calibration and direct reading galvanometer type for use of its membership.

Meetings are held at 3400 South Michigan Ave. every Thursday evening at 8 p.m.

All amateurs residing on the South Side of the city of Chicago and who are not now members are requested to get in touch with us.

B. W. Stolte, 9NJ, Asst. Sec'y.,
3554 So. Halstead Ave.

South Jersey Radio Association

The South Jersey Radio Association is at last on its pre-war footing.

At our last meeting on October 14th, we had fifty enthusiasts out. Great spirit was shown. We had a fine talk by Mr. Wexlin, 3GW, on a simple wireless telephone that really works and does not cost much to construct.

The Association, in order to advertise itself more, furnished Collingswood, N. J., with the election returns.

We have at the head of the technical committee Mr. Haig, manager of the Independent Wireless Company. You can rest assured the staff is a good one.

Collingswood, N. J., is our headquarters. Men from all parts of south Jersey flock there on the third Thursdays of the month. Why don't you join the happy throng? We will make it worth your while.

Radio Club of Tacoma

The Radio Club of Tacoma, which has recently become affiliated with the A.R.R.L. started up in November, 1919, but it was in existence several years before the war. Meetings are held every Tuesday at 8 p.m. in the Club's room in the St. Luke's Parish House. The officers are Leslie Lunan, acting President, H. J. Holt, Secretary, K. W. Weingarten, Treasurer, and Harold Manning, Asst. Secretary and Press Agent. There is a Wavelength Committee to tune all stations, an Interference Committee, and a Meetings and Papers Committee to arrange for talks at each meeting.

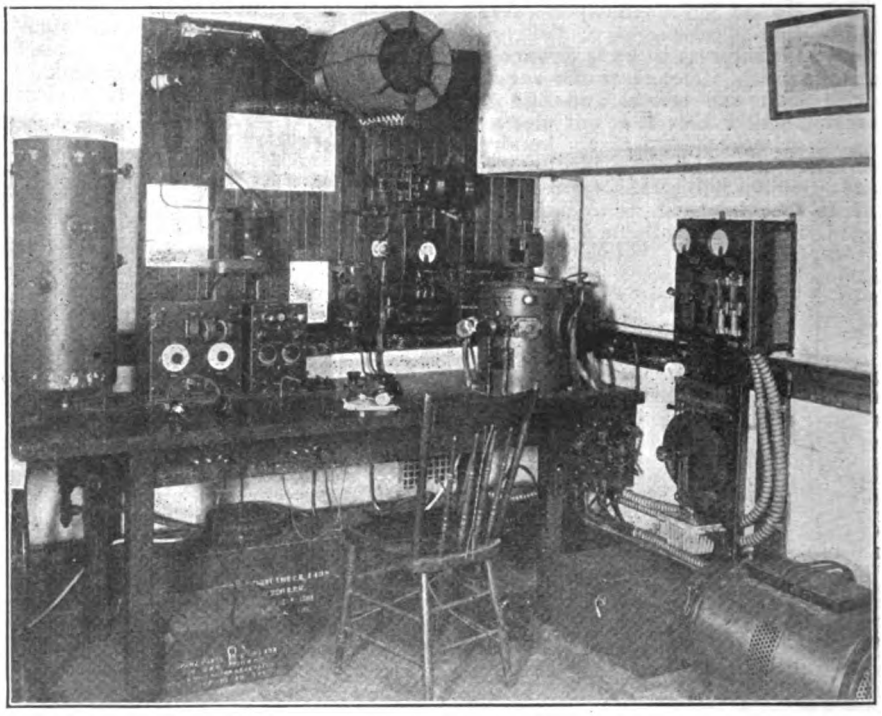
The Club has a nine o'clock curfew for local work so as to give the long distance men a chance. One thing about Tacoma that few cities of its size can say is that the operators here have had very little trouble or QRM from the "Great American Noise-Maker," the Spark Coil.

The secretary would be glad to hear from other clubs on any matters of interest. Address communications to Herbert J. Holt, 806 South Sheridan Avenue, Tacoma, Wash.

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3YG, PHILADELPHIA

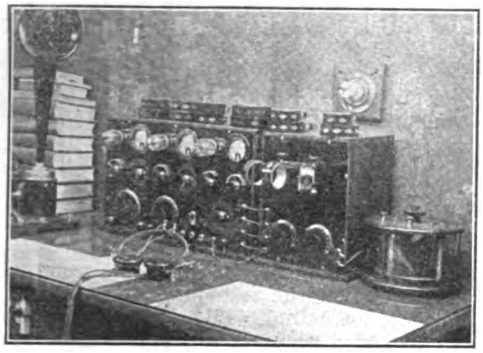


Probably many amateurs have heard 3YG and wondered who it was and what kind of a set was used. It is the station of the Philadelphia School of Wireless Telegraphy, which boasts of being the first school in this country to teach wireless exclusively, and the first on this coast to have an arc set in actual operation. Our photograph shows their arc set, which is a 2 k.w. Federal Poulsen, model Q, with a transmitting range of 2000 miles. This is not amateur equipment, of course, but there are features in this station that will interest QST readers, as most of us haven't much idea what an arc set looks like. A motor-driven chopper, which may be seen on the wall below the tuning inductances, is used for ICW on waves below 700 meters, while the straight arc is used for longer distances on the higher wave lengths, which are generally 2000 and 2700 meters. This station expects to conduct tests with similar stations located at the radio schools in Boston, New York, and Baltimore, as soon as all of them are in working order.

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A NEAT RECEIVING SET

This set was built by Mr. Roy Haynes, of 6939 S. May St., Chicago, and consists of honeycomb mounting and variables in the circuit described by Mr. Groves in QST for last March, used with a detector and two-step, equipped with ammeter for



each bulb. Mr. Haynes states that he gets wonderful results with this set on both spark and undamped, and the Magnavox provides radiophone music loud enough to dance to.

QST

Did we hear you say you would like to see more photographs of stations? Well, so would we, but this month we had no more interesting ones that would reproduce. You can help by sending in photos and description of YOUR station. Photos should be clear in detail, on glossy paper, and preferably flashlites 4" x 5" or larger.

L. A. BENSON

(Concluded from page 43)

it a QST or something else good in the radio line? No, gentle reader, it isn't. The original photograph in our office quite clearly shows that it's a fashion plate from a woman's magazine! But, then, wasn't he all dressed up when he had his picture grabbed?

LOUIS FALCONI

(Concluded from page 43)

radio operator on the Coast Survey U.S.S. "Bach", NLK, was offered him, and the desire to travel and operate a sure-enough station was so strong that the job was accepted. After six months of pea-soup, salt horse, and Scandinavian Turkey, the Doc decided that a trip west, for better or for worse, was needed. Thereupon arrangements were made for a trip to the land of "Injuns and wild men". The trip ended at Fort Stanton, N. M., and the stay lasted three years, during which time a home-made receiver was the only available radio apparatus, there being no A.C. During the war he moved to Roswell, and after the war a station was installed, and so 5ZA came into being. Present occupation, peddling and repairing "Exide" batteries and perfecting 5ZA at odd times.

OPERATING DEPARTMENT

(Concluded from page 42)

been standing alternate watches, thus keeping the station open practically every night. In this way, alternating with 9ZN, 9AU has handled successfully a great amount of relay traffic which has assisted in relieving the congestion at 9ZN.

FLICKER BALANCES

(Concluded from page 27)

might even be possible to use special vibrating interrupters in place of the motor type as a balance in case no motor is available.

Why not follow out some of the ideas presented above, and not only prevent the lights from blinking when the transmitter works, but get a five hundred cycle note, a few batteries charged, or a little cool air for your overheated instruments into the bargain?

*Author "Radio Buyer's and Builder's Handbook."

INDUCTION SHOOTING

(Concluded from page 30)

Maxim's silencers. There was a small door in the pole which covered the lowering mechanism, but after trying all the skeleton keys we had, then a hammer and a chisel, we had to abandon the idea of first aid. After about fifteen minutes debating, mostly spent in cussing at the lamp, we decided to go home, determined that if the power company didn't fix the trouble we would, and not according to any underwriters' rules either.

The next morning I got in touch with one of the power company officials who was also a radio man and he saw to it that the trouble was investigated and corrected. The trouble seemed to be an arc in the lamp base. The lamp was of the incandescent type connected in series on a 2200 volt over-head line. The offending lamp was located about one mile from 9ZN and less than one block from 9CD. Although the induction from this lamp was terrific within a radius of a little over one mile, it seemed to die out quite rapidly thereafter, as stations located about three miles away were unable to hear a sound from it.

The line apparently acted as an antenna and it couldn't have done the job better if it had been designed for the purpose. I was unable to be present when the repairs were being made and therefore cannot say positively what the trouble was, but I do know that it caused our power bill to take a drop.

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2BAD: Say, OM, what is a damped oscillation?

4NIT: I'm not sure, but I think it is somebody shimmying in the rain!

Ex-1IAA sends us an idea for mounting a tubular audion in the standard base of a burnt-out VT. Most of the latter have prongs consisting of very small pipe, into which the lead wires are soldered. They may be removed, the leads from the tubular audion inserted in their stead, the audion shoved down into the base as far as possible, sealing wax run in to hold it, and the new leads soldered in.

The Westinghouse Electric & Mfg. Co. announce their entry into the commercial wireless field. During the war this company carried on valuable research work in radio and so is equipped to assist in the advancement of the art. They have acquired control of the International Radio Telegraph Co., of New York, including its stations WCG, WCY, WSC, WLC, and WCI. They will be interested also in the manufacturing branch of the business, their great munitions factory near Springfield, Mass., having been equipped for the manufacture of all kinds of radio apparatus. Things of interest to the amateur are expected. It will be remembered that 8XK, the station of Mr. Frank Conrad at Pittsburgh, is licensed in the Westinghouse name, Mr. Conrad being a well-known Westinghouse engineer.

Regarding the recently-announced GE-WE patent merger, it is announced that the A.T.&T. has "bought into" the Radio Corpn. of America, and that an exchange of licenses has been agreed upon. This should entirely clear the vacuum tube situation, and it is also rumored that it presages the inauguration of ship-to-shore radiophone in connection with the Bell land lines, to which end the Western Electric experiments of the past year have no doubt been conducted.

Dear Eddie:

Who is 1BVD? I got him all summer, but not any more. I guess he's off for the winter, eh? He used to be in the air all over the country every Monday morning.

The Old Dog.

Operators from 9ZN covered the recent Moran-Leonard fight at East Chicago, 20 miles from Chicago, for the Chicago "Herald Examiner", with a DeForest radiophone and a portable ¼ k.w. transmitter, the arena being so situated that no telegraph or telephone wires were available. Mr. Hall, one of the sporting editors of the paper, dictated his report of the fight over the radiophone, the spark being used for calling. Mr. Hassel worked 9ZN and had a reporter at his end to take down the stuff, with phone connection to the Herald Examiner office.

The call letters of the new Lafayette station at Bordeaux are LAF, and the wave length is 23410 meters.

Kruse says 8XK's typewriter has a cold—and wouldn't it be wonderful it sometime in a fading report it would write "8ER" instead of "ADR"?

9LR is doing phenomenal work. 6EN, Los Angeles, reports him in the phones for a half hour on two recent nights, and as QSA as San Francisco when in on a swing.

The question of licensing amateurs in New Zealand is now before the House of Representatives and it seems almost certain that the necessary legislation will be passed. It looks practically as certain, however, that the new laws will give the New Zealand amateurs but very little more privileges than are "enjoyed" now by amateurs in England. It is that much, anyway. Anticipating licenses in the near future, amateur clubs are being formed in numerous N. Z. towns.

The gold cat-whisker is hereby awarded the amateur who was recently discovered with a big knob fastened to the vibrator screw on his spark coil. When he started to send he would have the vibrator unscrewed, and as he sent he tightened it up by the big knob, and vice versa as he got thru, giving a very creditable imitation of a rotary. What will they try next!

Pending the appearance of the government call book, the Managers of the Northwestern and Central Divisions mimeographed lists of call letters in their territories and distributed them for the use of

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relay stations. This was a great help and was much appreciated.

There's a "blacklist" hanging up in 1HAA's shack. The way to get listed on it is to transmit during the A.R.R.L.-BS fading tests.

When you write "that man with the big husky spark", bear in mind that you are one of a hundred doing the same thing—enclose a stamp. One hundred two's pay for a year's subscription to QST.

A soak on his ivory top-mast for the guy who hollers "QRM" when he means "QRS".

Will 2TF tell us how he makes his rotary jump ahead when he presses his key each time? It lends individuality.

Isn't it about time Runyon came back in the game?

Has any United States amateur succeeded in getting any Ediswan tubes shipped into this country? We understand the English firm is afraid of patent litigation here and will not make shipments to the States. The customers duty, by the way, it about 60%.

A new idea for rectifiers for CW has presented itself. We learn of several amateurs who are experimenting with electrolytic rectifiers. A number in series are necessary for each side of the circuit, as there is a critical voltage beyond which they cease to rectify. The current being small the jars may be small, one experimenter we know using test tubes, with elements of aluminum antenna wire and lead fuse wire, in a saturated solution of ordinary borax. If any of you will report your results in this line, the Editor will be glad to present them in QST for the benefit of the fraternity.

WOULDN'T IT BE WONDERFUL—

If 9ZJ's second operator would sign off with "ARK" instead of using "SK" every time?

If 1NAP would stay awake long enough to work 1AW and so prove that 1AW's 5 amps can cover seven miles? Final Authority please note.

If 9LR had a copy of the QR and QS abbreviations before him all the time and could send 30 a minute?

If 6ER wouldn't sit on his key at about 6 o'clock every evening?

If 1DY would send with the other foot once in a while?

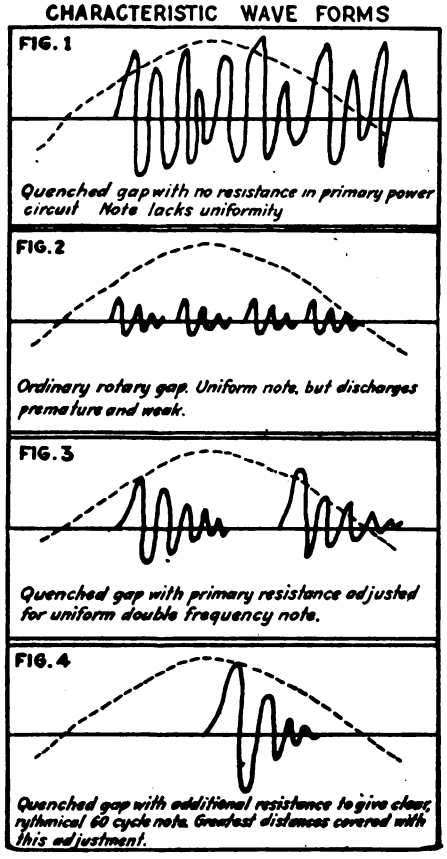
If Portland, Maine, had a live amateur in it who could be heard regularly on the job?

If 6ADU could work 7CU? And if 6KA wouldn't change his tone every day and ask everybody "QSB? QSA?"?

If we could regularly have those wonderful quiet spells that are common during the QSS tests?

Re Quenched Gaps

MUCH has been said pro and con on the subject of rotary and quenched gaps. Both gaps have been found to be good but the quenched gap has certain inherent advantages about which there seems to be considerable lack of knowledge. Briefly, the quenched gap causes the transmitter to radiate



maximum energy on a single wave length, reducing interference and increasing range, and is practically silent in operation even when operating at full power.

More in detail, a rapid quenching action quickly stops discharge of the transmitting condenser after the first and most powerful oscillations have passed. Thus, the induced energy is concentrated entirely on the antenna allowing it to radiate on a single sharp wave length and preventing a wasteful re-transfer of energy back into

(Concluded on page 66)

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CALLS HEARD

On account of the vast quantity of calls reported we must ask your co-operation in the following.

(1) List the calls on a separate sheet of paper—do not embody them in a letter.

(2) Arrange by districts from 1 to 9, and alphabetically thru each district; and run them across the page, not down a column.

(3) Put parentheses around calls of stations also worked.

(4) Omit initial or other unauthorized calls.

(5) State the period covered by your report.

8UD, CATTARAUGUS, N. Y. to Sept. 1
2EV, 2JU, 2XB, 2XJ, 2XX, 8CK, 8DA, 8DI, 8DV, 8EB, 8FM, 8GB, 8GW, 8HA, 8HB, 8KZ, 8IK, 8IL, 8LD, 8LW, 8LX, 8UI, 8UO, 8WY, 8XK, 8XU, 9AJ, 9CA, 9HR, 9CP, 9ZN, 9ZS.

2KV, BRONXVILLE, N. Y., July 1 to Sept. 20.
1AW, 1BM, 1BBZ, 1CBJ, 1CD, 1CE, 1CK, 1DL, 1DQ, 1FAQ, 1FV, 1FW, 1GY, 1HAA, 1JAP, 1NAQ, 1OAL, 1PG, 1RZ, 1SZ, 1TS, 1XE, 2BM, 2TF, 3BA, 3BC, 3BE, 3BG, 3BZ, 3CV, 3CW, 3DR, 3DS, 3EN, 3ES, 3EX, 3FG, 3FN, 3FR, 3FW, 3GH, 3GU, 3GX, 3HG, 3HJ, 3HO, 3JK, 3KM, 3LA, 3LP, 3LS, 3LY, 3MU, 3NB, 3OB, 3PE, 3PS, 3PU, 3RK, 3RW, 3SX, 3UA, 3UU, 3UC, 3VV, 3ZA, NSF, 5DA, 8ACF, 8AFA, 8BP, 8BV, 8CB, 8DA, 8DI, 8DV, 8DY, 8EN, 8ER, 8FG, 8HH, 8HP, 8IC, 8IK, 8JS, 8LA, 8LX, 8MB, 8MI, 8MT, 8NI, 8QM, 8RQ, 8RS, 8WY, 8XK, 8ZS, 8ZW, 9BS, 9EQ, 9IA, 9IO, 9IT, 9ZL, 9ZN.

2TF, SCHENECTADY, N. Y., July 20 to Sept. 5
(1AW), (1A—), 1AR, (1AS), 1AG, (1BBL), 1BM, (1BL), 1CK, (1CE), (1DQ), (1DR), 1ES, 1EK, 1EAR, (1FB), (1FV), 1FW, 1GY, 1GAO, (1HAA), 1HO, 1NAQ, 1NAX, (1QP) C.W., 1RZ, 1SZ, (1UN), (1XE), (1XB) phone, (2AJW), (2BM), (2BK), 2BG, 2CT, 2DN, 2EL, (2HI) C.W., 2HN, (2JU), (2MK), (2NF), (2OA), (2PL), 2QR, (2RK), 2SH, 2UC, 2WB, 3BG, 3DS, 3EH, 3EN, 3FB, (3NJ), 3IJ, 3JK, 3KM, (3NB), 3NO, (3OB), 3VV, 3XL, (3ZA), 8AD, 8BP, (8BV, 8CB, 8CH, (8DV), 8DA, 8DI, (8EN), 8EL, 8FO, 8GB, (8GY), 8IK, 8JU, (8JS), 8LK, 8LF, 8MT, 8ML, 8NI, (8QM), 8RW, 8SH, 8UO, 8XK, 8ZY, 9ZN, 9ZT.

3CS, TRENTON, N. J., July and August
1AW, 1CB, 1CE, 1CK, 1HAA, 1NAQ, 1XD phone, 2CX, 2EL, 2JU, 2NF, 2ME, 2QR phone, 2RC, 2RK, 2UE, (2VA), (2JZ), (2WB), 2YM, 2ZM C.W. and phone, 2ZV C.W., 2XX Mod. C.W. and phone, 2XF phone, 2XJ phone, 3BG, 3BZ, 3CM, 3EN, 3FB, 3FG, 3FL, 3FR, 3GR, 3GX, 3GV, 3HJ, 3HX, 3JM, 3KM, 3PW, 3MU, 3ARY, NSF, 3XH, 3ZA, 8LW phone, 8BP, 8DV, 8MT, 8WY, 8XK, 8ZW.

2AOS, MONTCLAIR, N. J., July 26 to Sept. 10.
1AW, 1EPE, 1JA, 1AS, 1HAA, 1PS, 1OAL, 1JH, 2XJ (phone), 2XC (phone), 2ARD (phone), 2WI (phone and C.W.) 2ZM (phone and spark), 2MT (C.W.), 2JP (C.W.) 3KM, 3BV, 3FG, 3CV, 3WN, 3HJ, 3AV, 3BG, 3LY, 3GB, 3GV, 3ZA, 3NB, NSF, 8DI, 8OV, 8XK, 8GY, 8MT, Two's too numerous.

3KD, PHILADELPHIA, July and August
1AW, 1AR, 1HAA, 1NAQ, 1XG (fone), 2BK, 2NF, 2JU, 2UE, 2XJ, 3NB, 3BH, 3KM, 3EH, 3RW, 8DA, 8DI, 8DY, 8ER, 8NI, 8SH, 8XK, 9HR, 9ZN.

2TT, NEW YORK, July 1 to Sept. 30.
1AK, 1AW, 1BL, 1DQ, 1FW (daylite), 1HAA (daylite), 1JAP, 1NAQ, 1RZ, 1XE, 2TF, 2BM, 3AAE, 3BG, 3BZ, 3CS, 3CV, 3EH, 3EN, 3EV, 3FB, 3FG, 3GX, 3HG, 3HX, 3HJ, 3KM, 3NB, 3ND, 3OU, 3RW, 3UC, 3VV, 3ZA, 3ZW, 4AE, 8ACF, 8BP, 8CB, 8DA, 8DR, 8EN, 8ER, 8FT, 8HH, 8IK, 8JS, 8LF, 8WY, 8XK, 8ZW, 9LC, 9ZJ, 9ZN, NSF, 2CM (Canadian).

6OC, SAN FRANCISCO.
6AK, 6AV, 6BQ, 6CT, 6CV, 6EA, 6EB, 6EJ, 6ER, 6FE, 6FH, 6FS, 6GE, 6IF, 6IH, 6II, 6IT, 6JD, 6JI, 6JM, 6JQ, 6KP, 6OH, 6PQ, 6QM, 6QR, 6SK, 6TC, 6UM, 6AAK, 6AAT, 7BJ, 7CF, 7CU, 7CW, 7ZI.

8ACF, WASHINGTON, PA., during Sept.
1AK, (1AW), 1CM, 1NA, 1RZ, 1SA, 1BBL, 1HAA, (2BK), 2BM, 2CM, 2DA, 2DJ, 2EF, (2EL), (2GR), 2HG, 2HT, 2JU, (2JZ), 2KM, 2NF, 2RK, 2WB, 2TF, (2ZL), 2AIF, 3BZ, 3CT, (3DH), 3HJ, 3KM, 3ZW, 4CC, 4CP, 4BQ, 4DL, (5DA), 5HA, (8AM), 8FI, 8FT, (8GW), (8JS), (8AAW), (8AJT), (9AU), 9AP, 9DV, 9EQ, 9EE, 9KV, 9GK, (9GX), 9HR, 9IF, (9HM), 9LR, 9NQ, (9VS), 9ZJ, (9ZL), 9ZN, 9ZQ, 9AAP, 9AAX.

4BZ, ATLANTA, GA., April 22 to May 30
1AW, 1EP, 1ZG, 2BM, 2FG, 2ZM, 2XJ (fone), 2ZS, 3FG, 3GO, 3NC, (3XA), 3XF, (NSF), (4AE), 4BB, 4BK, 4BQ, 4CC, (4YB), 5AP, (5BT), (5BZ), (5DA), 5EA, (5YE, 5ZP, (5ZX), 5ZY, 8DA, 8DC, (8ER), (8JQ), (8LA), 8LR, (8NZ), 8PJ, 8WY, (8XA), 8XP, 9AK, (9CA), 9CE, (9GO), 9GX, (9HN), 9IJ, (9KV), (9LC), 9NK, 9OV, 9PS, (9PV), 9QJ, (9RP), 9UG, 9YA, 9YB, (9ZL), 9ZT.

2HN, LONG ISLAND CITY, Aug. 15 to Sept. 20.
1AW, (1BM), (1BBL), (1CK), 1DQ, 1FAG, 1GY, (1GAX), (1HAA), 1HAX, (1NAQ), (1PY), 1QR C.W., 1RZ, (1SZ), 1TL, 1VB, 1VG, (2BK), 2BM, 2CT, 2DN, 2EL, (2GR), (2HJ), 2JN, 2JZ, (2JU), 2MC, 2OA, 2PT, 2RK, 2WI, (2YM), 2ZL C.W., 2ZM, 3BG, (3BZ), 3EH, 3EN, 3DC, 3GX, 3HG, 3HJ, (3KM), 3OB, 3VV, 3ZB, (3ZE), 4CC, 4CP, 8BP, 8BV, (8DR), 8DJ, 8DZ, 8EN, 8GS, 8HH, 8HM, 8JS, 8JJ, 8LL, 8PQ, 8ST, 8XK C.W., 8IW, NSF fone, (8ZD), 9AP, 9EQ, 9HR, 9VS.

9AP, CHAMPAIGN, ILL., September.
1AK, 1AW, 2JZ, 2RK, 3ND, 3BZ, 3ZW, 4AE, (4BQ), (4YA), 5YH, 5CD, 8DR, 8ZD, (8HH), 8CI, 8FT, 8CB, (8HG), (8DZ), 8OI, 8GE, (8LA), 8AM, (8LF), 8OZ, (8XK), (8GB), 8NG, (8ZY), (8EN), 8UO, (8DI), 8DF C.W., (8GY), 8IN, (8DV), (8IK), 8ML, 8FI, 8CF, 8LW, 8WY, 8JJ, 8NI, 9AX, 9AV, 9AA, (9AEG), (9AIG), 9AFB, 9ACY, 9ABL, (9AT), 9AMK, 9ABJ, 9AUF, 9IO, 9FS, (9HM), (9ZL), (9ZC), (9EE), 9HD, 9EL, 9LR, 9ZQ, 9FL, 9AEQ, 9GN, (9LC), 9KV, (9CS), (9HR), 9GC, 9OE, 9FN, 9GP, (9PN), 9UU, 9SN, 9US, 9WZ, 9KO, 9NJ, 9EC, 9AGN, 9BW, (9CP), 9UV, 9ZT, 9ZY, 9QM, 9BO, 9OR, 9ZW, 9NJ.

1AW, HARTFORD, CONN., Oct. 12 to Nov. 2.
(1AK), (1AZ), (1BM), (1CK), 1FQ, 1JQ, (1OE), (1QN), 1WP, (1WR), (1XT), 1XK, 1XZ, (1XV), (1YB), (1BBH), (1BBL), 1CBQ, (1EAS), (1HAA), (1NAQ), 1TAZ, 1UAW, 1VAD, 2BK, Canadian 2CI, (2DN), 2JZ, 2JJ, 2OM, 2RB, (2RK), 2TF, (2WB), (2ZL), 2ZM, 2ACM, Canadian 3Z, (3BZ), 3FN, 3GO, 3HJ, (3DH), (3EV), (3KM), 3XF, (3ZA), (3ACM), (NSF), (WWV), (4YB), 8AY, 8BU, (8CB), 8CH, 8DG, 8DP, 8DV, (8ER), 8FC, 8FJ, 8FD, 8GU, 8GW, 8HA, 8HF, (8HH), 8IK, 8JJ, 8JQ, 8JS, 8KE, 8MT. 8MQ, 8NI, 8OJ, 8PC, 8QM, 8QA, 8RW, 8SP, 8SH, (8XU), (8XK), 8XJ, (8ZW), 8ZG, 8ZS, 8ZP, 8ZY, 8AAN, (8ACF),

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8AMB, 9AL, 9AU, 9JN, 9LQ, 9ZJ, (9ZL), (9ZN), 9AAV.

8AN, DETROIT, MICH., October.
NSF, 1AW, 1HAA, 1IW, 2BK, 3BZ, 3DH, 3HJ, 3NB, 5FV, 8AP, 8BG, 8BP, 8CF, 8DG, 8DI, 8EN, 8ER, 8FD, 8FI, 8FT, 8HH, 8JT, 8NI, 8WY, 8OJ, 8QJ, 8RN, 8XA, 8XI, 8XK, 8YV, 8ZA, 8ZB, 8ZC, 8ZW, 8ZY, 9AC, 9AP, 9AU, 9AJY, 9HM, 9HR, 9LQ, 9ZJ, 9ZL, 9ZN.

1AK, FALL RIVER, MASS., Oct. 11 to 28.
(NSF), (1AW), (1CK), (1DY), (1FBF), (1HAA), (1IAW), 1IS, (1KAQ), (1PAW), 1PY, 1XD, 1XX, 1YB, (2BM), 2CE, 2CT, (2DA), 2DN, (2JZ), (2OA), (2RK), (2RM), 2WB, 2ZL, 3BZ, (3DH), 3HJ, (3KM), (3PU), 3SW, (8ACF), 8CB, (8DE), 8ER, (8HH), (8DI), 8FT, 8GW, 8IK, (8JU), (8KE), (8LA), 8MZ, 8NI, 8NZ, (8RQ), 8SP, 8WY, 8XK, 8XU, 8ZA, (8ZD), 8ZW, 9HR, 9IR, 9LQ, 9ZJ, 9ZN.

9ZN, CHICAGO, ILL., From Sept. 9th to Oct. 15th.
1AW, 2GR, 2JZ, (2RK), 3JK, (3BZ), (3DH), (5ZL), 5XH, 5CG, (5YH), 5XA, 5ZC, 5YM, (8JJ), 8ZV, (8XC), 8FN, (8FT), (8CB), 8AM, 8ACF, 8LA, 8OI, (8ER), (8DI), 8ML, (8ZW), (8HH), (8DV), (8HG), 8GB, 8RQ, 8MZ, 8AW, 8XK, 8TT, (8ZG), 8ZD, (8RO), 8ZC, (9GP), 9NQ, 9HM, 9AAF, 9LC, 9EE, 9CP, (9ZL), 9AP, 9AEQ, 9EQ, 9ZQ, (9ZV), (9LR), (9ZX), (9HR), 9ZC, (9KV), 9CS, 9JT, 9KO, 9LQ, 9AOJ, 9CA, 9CV, 9GN, 9RV, 9AON, (9AOJ), (9AEQ) 9FU, 9CO, 9OF, 9AMQ, 9AAP, 9PI, 9NP, 9QJ, 9FR, 9HY, (NSF).

CANADIAN 3GS, September,
(Bridgeburg, Canada: near NNZ.)
1AW, 1HAA, 1FB, 1QI, 1TS, 1VD, 1XD, 2CT, 2BF, 2EE, 2DH, 2JU, 2OZ (?), 2XH, 2ZL, 3BG, 3BZ, 3CO (Can.), 3DS, 3DV, 3GO, 3GE (Can.), 3GX, 3HE, 3KK, 3KM, 3AK, 8BV, 8BM, 8CB, 8DA, 8DE, 8EN, 8NI, 8PF, 8QM, 8SI, 8ACF, 9HM, 9ZL, 9ZN, NSF.

9CS, CLINTON, IOWA, Sept. 25 to Oct. 7.
8KM, 5CD, 5CF, 5CG, 5ER, 5IS, 5XC, (5YH), 5ZC, 5ZL, 5ZP, 8CB, (8DI), 8ER, (8FT), 8HG, 8HR, 8NI, 8XK, 8ZW, 8ACF, 9AJ, (9AP), 9CA, 9DC, 9DT, 9EE, 9EK, 9EL, 9EQ, 9ER, 9EZ, 9FR, 9FU, (9GC), 9GN, 9GQ, 9HM, (9IX), 9JL, 9JT, 9KO, (9KV), (9LC), 9LM, 9LR, (9LU), (9MS), (9NQ), 9OE, 9OR, 9QM, 9QY, 9RG, 9RY, 9VS, 9WG, 9WT, 9ZC, 9ZJ, 9ZN, (9ZV), 9AAF, 9ABL, 9AEG, 9AEQ, 9AEP, 9AJI, 9AOJ, 9ANV, 9AOC, NSF.

8AEQ, COLUMBUS, OHIO, June 1st to Aug. 1st.
8CC, 8CI, 8DA, 8DV, 8DJ, 8DR, 8DW, 8EN, 8ER, 8FF, 8FI, 8GB, 8GQ, 8HH, 8IK, 8MT, 8WY, 8XK, 8ZR, 8ZW, 8ZY, 9ZN.

3VV, NORFOLK, VA., Sept. 10th to Oct. 10th.
1AW, 1HAA, 1RZ, (2BG), (2BK), (2CT), (2DN), 2EH, (2EL), 2HN, 2HR, (2JZ), (2NB), 2QL C.W., (2RK), (2ZL), (2ARD C.W.), (3BZ), 3BS, (3DH), 3DK, (3EH), (3GB), 3GR, (3HG), (3HJ), (3IW using ¼ inch spk. coil), (3JK), (3LS), 3LZ, (3RW), 3XF, 4AA, 4AG, 4AL, 4CC, 4CK, 4DM, (4XA), (4XC), 4XQ, 4ZN, 5ER, 5GH, 5HG, (5HY), 5NK, 5XA, 5ZL, 5ZR, 5ZZ, 8AI, 8CB, 8CI, 8DG, (8DI), 8DR, 8DZ, 8EN, (8ER), (8FM), (8FT), 8HH, (8IK), 8JT, (8KE), 8KI, 8KV, (8LF), 8LR, 8OZ, 8PF, 8RC, 8RG, 8RW, 8RY, 8TT, 8VP, 8WT, 8XI, (8XK C.W.), 8ZA, (8ZD), 8ZE, (8ZG), 8ZN, (8ZW), 9CA, 9CM, 9CV, 9GN, 9KV, 9LM, 9LR, 9OX, 9ZN, 9ZR, 9AAF, NSF.

8ZD, PITTSBURGH, (ex-8EN),
from Aug. 5th to Oct. 10th.
1AE, 1AK, (1AW), 1FB, 1FM, (1HAA), 1RZ, 1XD (phone and C.W.), 1ZA, (2AER), (2BK), (2BM), (2BG), (2CS), (2CT), 2DA, (2EL), (2GR), (2HN), (2JU), (2JZ), 2ME, (2NF), 2NM, 2QR, 2RB, 2RK, (2TF), (2UC), 2UE, 2VA, 2XJ (phone and C.W.), (3BZ), 3CH, 3DH, (3EN), (3FG), (3HJ), (3KM), (3VV), 3WS, (3XF), (3UC), (3NV), 3ZW, 4AG, 4BL, 4BQ, 4CC, 4XC, 4YA, (5DA), 5ER, 5KT, 5XA, (5ZL, 5ZP, NSF, KQO, XF-1 (C.W.), 8AHA, (8BV), 8BO, (8CB), (8CF), 8DA, (8DI), (8EJ), 8ER, (8FI), (8FO), (8FT), (8GB), (8GI), (8HH), 8IK, 8IL, 8ID, 8JJ, (8JS), (8KE), 8LA, (8MT), 8ML, (8NI), (8OJ), 8PQ, (8RW), 8SP, 8TT, (8OI), (8WY), (8XA), (8YV), (8ZA), (8ZG), 8ZQ, (8ZW) (phone), 9AK, 9AP, (9AU), 9AFA, 9AFR, 9CA, 9CP, 9DU, (9FN), 9FU, 9GN, 9HM, 9HR, 9KO, (9KV), 9ZJ, (9ZL), 9ZN, 9ZQ.

3EH, COLLINGSWOOD, N. J.
(1BL), (1HAA), 1GM, 1QR, (1RZ), 2EL, 2ER, 2FH, 2NF, 2RK, 2WM, 3EK, 8BV, 8DI, 8EF, 8EN, 8MI, 8NO, 8SH, 1AA, (1AW), 1DY, 2BB, 2BM, 2CT, 2FG, 2JG, 2TF, 2WB, 2ZL, (3BE), (8BH), (3BZ), 3FG, 3KM, (3VV), 3VW, 3ZW, 3BF, 8CB, 8DV, (8ER), 8HH, 8FO, 8JJ, 8LF, 8MT, 8PU, 8XK, 8ZA, 8ZG, 8ZW, 9ZN, 9ZL.

4BE, WILMINGTON, N. C., Oct. 15th to Sept. 15th.
1AW, 1XF, 1XD, 2NF, 2ZL, 2RK, 2ZM, 3KM, 3BZ, 3FG, 3PK, 4AE, 4AG, 4AT, 4BL, 4BQ, 4CP, 4YA, 5DA, 5ER, 5ZC, 5XA, 8BP, 8CB, 8DJ, 8EN, 8ER, 8ID, 8NI, 8RO, 8RQ, 8RW, 8XK, 8YV, 8ZW, 8ACF, 9AE, 9AP, 9EQ, 9ZJ, 9ZN, 9ZV, NSF.

8AJK, BUCYRUS, OHIO
8AFB, 8AF, 8AJ, 8DI, 8DR, 8ER, 8FI, 8FT, (8GB), 8GN, (8HH), 8HG, 8IK, 8IZ, 8JF, 8JJ, 8LE, 8MA, 8OI, 8QJ, (8QP), 8QU, 8SH, 8UO, (8VJ), (8WZ), 8XA, 8XK, 8YV, 8ZY, 8ZW, 8ZG, 9AAF, 9AA, 9AKH, 9AU, 9AJI, 9FS, 9GB, 9GN, 9DZ, 9HR, 9LR, 9FN, 9KO, 9ME, 9OI, 9ZJ, 9ZL, 9ZN, 5DA, 5ZL, 3KM, 3DH, 3VV, 5TW, (8ALM), 8DM, 8OJ, 9AF.

Calls heard on S.S. LAKE FANDANGO
off PROVIDENCE, R. I., one to two A.M., Oct. 1?.
2WZ, 2ZJ, 3AEM, 3DH, 3JZ, 3KH, 3ZV, 8AH, 8CB, 8DE, 8GP, 8FW, 8NB, 8NI 8SH, 8XK, 8ZG, 8ZW, 9ZN.

3UQ, YARDLEY, PA., Sept. 5 to Oct. 1.
1AW, 1BL, 1CK, 1DY, 1FA, 1SQ, 1XD and 1XJ (phone), 2BM, 2BL (phone), 2CT, 2DF, 2EL, 2GP 2GN, 2JU, 2JZ, 2ME, 2NF, 2RK, 2UB, 2UE, 2U 2VA, 2XX, 2ZL, 3BE, 3BM, 3BZ, 3CV, 3DF, 3E 3FG, 3FJ, 3GH, 3GX, 3HG, 3IB, 3KM, 3QH, 3R 3RW, 3TX, 3VW, 3VV, 3AAE, 3ABV, 5DA, 8A 8CB, 8DF, 8DI, 8DV, 8DJ, 8EN, 8EV, 8EX, 8F 8HI, 8IF, 8JS, 8JV, 8LO, 8MT, 8ML, 8NI, 8C 8RQ, 8RZ, 8SP, 8XK, 8YV, 9ZL, NSF.

8WE, ELMIRA, N. Y., Sept. 19-30.
1BL, 1HAA, 1JA, 1XD, 2XJ, 3BD, 3BG, 3BQ, 3KM, 3ZS, 8BV, 8ER, 8HA, 8HR, 8QW, 8RA, 8WY, 8ZW.

Received at 1MB, LYNN, MASS., Jan. to Oct. 8.
1AW, 1BM, 1EK, 1FB, 1FR, 1FV, 1II, 1IW, 1JP (daytime), 1PM, 1PY, 1RL, 1TS, 1XF, 1ZA, 1ZC, 1AAU, 1EAV, 1HAA, 1HAL, 1DBU, 2BG, 2BK, 2BM, 2BR, 2CB, 2CL, 2CS, 2DN, 2EL, 2ER, 2FG, 2GR, 2HN, 2JE, 2JU, 2JZ, 2LO, 2NC, 2NF, 2OA, 2PL, 2QR, 2RB, 2RK, 2SH, 2TF, 2VA, 2WB, 2XJ, 2XH, 2ZL, 2ZC, 2ZM, 2ZS, 2AVF, 2AJW, 3AA, 3BH, 3BZ, 3CU, 3DH, 3EN, 3EV, 3FG, 3GO, 3GV, 3HJ, 3HX, 3KM, 3NB, 3NC, 3NV, 3VV, 3ZA, 3ZC, 3ZW, 3AMO, 8BB, 8BV, 8CV, 8DA, 8EN, 8E 8HG, 8JQ, 8LF, 8WY, 8XU, 8XK, 9ZN, NSF.

9AIF, SIOUX FALLS, S. D., September.
5AO, 5CD, 5CG, 5DA, 5IS, 5ZA, 5ZC, 5ZL, 7I 8ZA, 9AEG, 9AEQ, 9ACV, 9AMB, 9AON, 9AP 9AEU, 9AJN, 9AE, 9AP, 9BA, 9CA, 9EE, 9E 9EW, 9EL, 9FL, 9FZ, 9FP, 9FR, 9GN, 9GC, 9HM, 9HT, 9HR, 9IF, 9JN, 9JT, 9JB, 9KV, 9LC, 9LR, 9OE, 9PI, 9PN, 9PS, 9RY, 9ZQ, 9ZC, 9ZT, 9ZL, 9ZU, 9ZN, 9ZV, 9ZX.

1TS, BRISTOL, CONN., Sept. 1 to Nov. 1.
(1AAT C.W.), 1AAU C.W., 1AK, 1AN, 1AS, (1AW), 1AZ, 1BB, (1BBL), 1BL, 1BM, 1CM, 1CK, 1DJ, 1DQ, 1DR, 1DY, 1EAS, 1EAT, 1EAV, 1EBN, 1EP, 1FAQ, (1FBK) spk., C.W. and fone, 1FQ spk., C.W. and fone, 1GAW, 1GY, 1HAA, 1IAO, 1IAX, 1IS, 1AP, 1JD, 1JQ, 1KAQ, (1KAZ) spk., C.W. and fone, (1NAQ), (1NAT), 1NO C.W. and fone, 1OE, 1PY, 1QAV, 1QN, 1RU C.W., 1RZ, 1SZ, 1VAA, 1XD fone, 1XT spk. and C.W., 1XV

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C.W. and fone, 1XX C.W., 1XB, 2ACM, 2ADD spk. C.W. and fone, 2ADM, 2AER, 2AJW, 2AM, 2ARA, 2AOS, 2BB, 2BG, 2BK, 2CI, 2CT, 2DA, 2DI, 2DN, 2DR, 2EH, 2EL, 2GR spk., C.W. and fone, 2HN, 2JJ, 2JO, 2JU, 2JZ, 2KN, 2MP, 2NB, 2NF, 2OA, 2OE, 2OM, 2RK, 2RM, 2RR, 2SH, 2TF, 2TR, 2UE, 2UK, 2WB, 2WD C.W. and fone, 2WG, 2XF fone, 2XH, 2XJ fone, 2XX C.W., 2ZC, 2ZL C.W., 2ZM, 3AAP, 3ABD, 3ACI, 3ACM, 3BC, 3BG, 3BH, 3BZ, 3DC, 3DH, 3DL, 3DR, 3DS, 3EH, 3EN, 3EV, 3FB, 3FG, 3FL, 3FR, 3GO, 3GV, 3GX, 3HG, 3HJ, 3IY, 3JK, 3KM, 3NB, 3ND C.W., 3OU, 3PU, 3QW, 3RW, 3VV, 3ZA, 3ZE, 3ZS, 3ZW, 4XB C.W., 8ABG, 8ACF, 8AFM, 8AGZ C.W., 8AIO, 8AY, 8BO, 8BV, 8CB, 8DI, 8DR, 8DP, 8BP, 8DV, 8EN, 8ER, 8FC, 8FD, 8FK, 8FO, 8FT, 8FW, 8GI, 8GS, 8GW, 8ID, 8IN, 8HA, 8HF, 8HG, 8HH, 8HP, 8IK, 8JJ, 8JS, 8KE, 8LA, 8LF, 8LG, 8LW, 8ML, 8MQ, 8MT, 8NI, 8NZ, 8OJ, 8OZ, 8PU, 8QM, 8RQ, 8RU, 8RW, 8SH, 8SJ, 8SP, 8UI, 8VX, 8WY, 8XC C.W., 8XK C.W. and fone, 8XP, 8XU, 8ZA, 8ZD, 8ZG spk. and C.W., 8ZQ, 8ZS, 8ZV spk. and C.W., 8ZW, 9AA, 9AD, 9JI, 9AP, 9CA, 9DV, 9GC, 9HR, 9KF, 9KM, 9LM, 9YA, 9YI, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZX, Canadian 8Z.

9LR, ANTHONY, KANSAS.

8RK, 8RW, 4XC, (5AI), (5AO), 5AY, (5BI), 5BO, (5CD), (5CG), (5DW), (5EF), 5FP, 5HA, 5LL, (5YH), (5ZA), (5ZC), 5ZN, 5ZP, 5ZS, (5ZT), (5ZU), (5ZV), (5ZW), 6EJ, 6JB, 6JD, 7CC, (7IM), 8CF, 8DA, (8DI), 8ER, (8HG), 8ID, 8JJ, 8LA, 8XD, (8ZY), 9AJ, (9AK), (9AN), 9AO, (9AP), 9AT, 9AU, (9AX), (9CA), (9CS), 9CV, 9EE, 9EI, (9EL), (9EQ), (9EZ), (9FB), (9FL), (9FN), (9FP), (9GC), (9GN), 9GQ 9HI, (9HM), 9HR, 9HS, (9IP), 9JT, 9KF, (9KO), (9KV), 9KX, (9LC), 9LF, 9LG, 9MC, (9NQ), (9PI), (9PN), (9QM), 9RM, (9RN), 9RQ, 9RY, 9VS, (9WI), 9YA, 9ZC, (9ZJ), (9ZN), 9ZQ, 9ZT, (9ZV), (9ZX), 9AAV, 9ABL, (9ACB), (9ACN), (9ACV), 9AEL, (9AEP), (9AEQ), (9AEU), (9AIG), (9AJI), 9AIF, (9AJN), 9AMB, 9ANG, (9AOJ), (9AON).

5DW, GREENVILLE, TEX., Sept. 18 to Oct. 12.

4AC, 4AE, 4BQ, 4XC, 4XQ, (5AI), (5AO) 5BO, 5BG, 5BI, 5BO, 5BQ, (5CD), (CG), 5CI, 5DI, (5ED), 5EF, 5EG, 5ER, 5FA, 5GU, 5HA, (5HV), 5IB, (5IE), 5UG, 5XA, 5XD, 5XG, 5XU, 5YE, 5YH, 5YS, (5ZA), (5ZC), 5ZH, (5ZL), 5ZN, 5ZP, 5ZR, 5ZT, (5ZU), 5ZV, 5ZW, (5ZZ), 8DI, 8DY, 8ER, (8FT), 8JJ, 8ML, 8XK, 8YW, 8ZG, 8ZW, 8ZY, 9ABF, 9ABI, 9ABU, 9AC, 9ACB, 9ACN, 9AE, (9AEG), 9AEK, 9AEP, (9AEQ), (9AEU), 9AEY, 9AFS, 9AHF, (9AIG), 9AJN, 9AK, 9AKB, 9AOC, 9AOE, 9AOJ, 9AON, 9AP, 9APC, 9APY, 9AU, 9BC, 9BEM, 9BQ, (9BW), 9BY, 9DT, 9DY, 9EL, 9EQ, 9ER, 9FC, (9FL), 9FP, 9FR, 9FT, 9GC, 9GN, 9GP, 9GU, 9GX, 9GY, 9HI, 9HM, 9HR, 9JN, 9KI, 9KO, 9KQ, (9KV), 9LG, (9LR), 9LM, 9LX, 9NQ, 9NX, 9OE, 9OR, 9PT, 9QG, 9QM, 9RW, 9TA, 9UU, 9VP, 9VS, 9WZ, 9XE, 9XG, 9XM, 9YG, 9YM, 9ZC, 9ZH, 9ZJ, 9ZL, 9ZN, 9ZX.

8RQ, SPRINGDALE, PA.

(1AW), 1AAP, 1BBL, 1CB, 1HAA, 1JU, 1RZ, 1TS, 2AD, 2BK, 2BM, 2CH, 2DA, (2DR), 2EL, 2GO, 2GR, 2JB, (2JE), 2JU, 2ME, 2NF, 2OA, 2QR, 2RK, 2RR, 2TF, (2WB), 2XJ, 2XX, (2ZL), 2ZR, 3AAP, 3ACS, 3AN, 3BE, 3BF, 3BG, 3BH, 3BI, (3BK), 3BZ, (3EN), 3EV, 3FG, 3GC, (3GO), 3GR, (3HG), (3HJ), (3KM), 3LG, (3NB), 3NC, 3NT, (3NV), 3OB, 3VJ, 3XF, 3XG, 3XN, 3ZM, 4CC, 4YN, 5BA, 5DA, 5YE, 5ZP, 8AA, 8BB, 8BP, (8BQ), 8BZ, 8CH, 8CF, (8DA), 8DI, 8DY, 8EJ, 8ER, (8FD), (8GB), 8GE, (8GI), 8GH, (8GK), (8GS), 8HG, 8HJ, 8IK, 8JJ, 8KG, (8LA), 8MA, 8ML, 8NI, 8OZ, 8PP, 8RB, 8RS, 8SH, 8TI, 8TN, 8TT, 8TY, 8UO, (8WY), 8XA, (8XU), 8XM, 8ZV, 8ZX, 8ZY, (9AK), 9AL, 9AT, 9CA, 9CB, 9CE, 9CK, 9HR, 9IS, 9LF, 9LQ, (9MH), 9OR, 9RY, 9ZJ, 9ZL, 9ZN.

2GK, SCHENECTADY, N. Y., July and August.

1AW, 1AE, 1AK, 1BM, 1CE, 1CK, 1ES, 1GM, 1HI, 1HAA, 1QV, 1RD, 1SE, 1TW, 1TS, 1YB, 1YN, 2ANN, 2DA, 2BM, 2ED, 2JE, 2JU, 2ME, 2LX, 2OM, 2OA, 2VA, 2ZM, 2ZL, 2XX, 2XG, 3DH, 3EN, 8BB, 8DA, 8ER, 8EN, 8XU, 8XK, 9ZJ, 9ZN, NSF.

9AEU, DAVID CITY, NEB., Aug. 20 to Oct. 7.

4XA, 4XC, (5AI), 5AL, 5AO, 5CD, 5CG, 5CW, (5DW), 5EF, 5FA, (5IS), 5IF, 5IE, 5XG, 5ZA, 5ZC, 5ZD, 5ZL, 5ZV, 8DZ, 8ER, 8FT, 8IK, 8OZ, 8ZY, 8ACB, 9AK, 9AU, 9AX, (9EW), 9FL, 9FP, 9GC, 9GN, 9HM, 9HS, 9IE, 9JS, (9KV), 9LC, (9LM), (9LR), (9NQ), 9NR, 9MS, 9OE, (9PN), 9RK, 9RR, 9RY, 9SC, (9UU), 9VE, 9VS, 9WI, 9YO, 9ADN, (9AEG), 9AEP, (9AEQ), (9AFX), (9AJN), 9ALB, (9ANQ), 9HOJ, (9APN).

3PB, PHILADELPHIA

1AK, 1AW, 1BL, 1DY, 1HAA, 1LL, 1XD, 1XE, 2HN, 3AL, 3BI, 3BZ, 3EN, 3GO, 3KM, 3RM, 3ZW, 4AI, 8GR, 8IK, 8LA, 8NI, 9ZN.

9AKG, CLEVELAND, Aug. 20 to Oct. 16.

1AC, 1AW, 2NF, 3BQ, 3VV, 5ZP (heard five mins. then faded), 8BO, 8BV, 8DG, 8DV, 8EN, 8ER, 8HE, 8IK, 8JJ very QSA, 8LS, 8MM, 8MT, (8OI), 8QJ, 8TT, 8XK, 8ZB, 9FB, 9FS, 9HR, 9LM, 9LR very QSA, 9MB, 9OR, 9ZN.

8HH, MANSFIELD, OHIO, Sept. 1st to Oct. 15th.

(NSF), 1AW, 1HA, (2BK), 2DH, 2EL, 2HN, 2JU, 2LQ, 2RK, 2TT, 2YH, 2ZC, 2ZL on C.W., 2ZM, 3AH, 3BG, 3BL, 3BZ, 3CW, 3DH, 3EN, 3GR, 3HG, 3HI, 3HJ, 3JZ, 3KM, 3NX, 3OG, (3VV), 4AE, 4AG, (4BQ), 4BZ, 4CC, 4YH, 5AO, 5BZ, 5CD, 5CQ, (5DA), 5ER, 5FV, 5XA, 5XC, 5XH, (5YH), 5ZC, 5ZL, 5ZP, 8AM, 8BN, 8BL, 8CA, 8CB, 8CD, (8CF), (8CF), (8DA), 8DG, 8DI, 8DR, 8DV, 8DX, 8EN, 8ER, 8FI, 8GB, 8GS, 8GW, 8GX, 8HE, 8HG, 8HR, 8HT, (8IB), (8ID), 8IN, (8IZ), (8JF), (8JJ), 8KF, 8LF, (8LS), (8ML), (8MM), 8MT, 8NQ, (8OI), (8QJ), 8QY, 8RA, 8RI, 8RQ, (8UO), 8VW, 8WY, (8WZ), 8XC, 8XD, (8XK), 8XL, 8ZA, 8ZB, 8ZD, (8ZG), 8ZW, 8ZX, 8ZY, 8ACF, 8AGX, (8AJK), (8ALM), 9AA, 9AW, 99K, 9AP, 9AV, 9AW, 9AX, 9BC, 9CA, 9CF, 9CH, 9CP, 9EE, 9EQ, 9EX, 9FP, 9FR, 9FD, (9GN), 9GX, (9HM), 9HO, (9HR), 9IP, 9KD, (9KV), 9LC, 9LR, 9OE, 9OR, 9QJ, 9SK, (9ZN), 9ZX, 9AAF, 9AJI, 9AUU, 9DAF, 9OAJ.

Heard by L. W. HATRY, 2048 8th St., PORT ARTHUR, TEXAS, Sept. 13 to Oct. 12 inclusive, on a 20 foot aerial in attic of two story house. 5AO, 5AS, 5BO, 5CD, 5CG, 5DW, 5EO, 5EF, 5YH, 5ZC, 5ZW, 5ZL, 5ZV, 8ER, 9AB, 9AEG, 9AQG, 9AP, 9AIG, 9FL, 9GC, 9LR, 9OE, 9KV, 9RY, 9SW, 9WU, 9ZC, 9ZV. **Will answer any letter or card about the above list.**

9EQ, ST. LOUIS, Sept. 13 to Oct. 13.

2BK, 2RK, 5AO, 5CD, 5DA, 5EF, 5ZC, 5ZP, 5ZZ, (5ZL), 8AT, 8ER, (8FT), 8XK, 8ZI, 8XA, 9AK, 9AL, (9AP), 9AV, (9AU), (9AX), (9AEG), (9AEQ), 9AE, (9EL), 9EE, 9EZ, 9ES, 9FM, (9FL), 9FV, 9GX, 9GC, (9HM), (9HR), 9IP, 9JE, (9LR), 9NQ, 9OE, 9QP, 9RG, (9TU), (9UU), 9VS, 9XM, 9ZN, 9ZL, (9ZC), 9ZH, (9ZJ), (9ZQ), 9ZP.

9ZL, MANITOWOC, WIS., Oct. 9-24th.

(1AW), 1BM, 1FM, 1HAA, (2BB), (2BM), 2DA, 2EL, 2EN, (2RK), 2RV, 2XX C.W. and fone, 2ZM, 3ABD, (3DH), 3EN, 3FG, 3HH, 4BQ, 4XC, 5BE, 5CG, 5DW, 5ZL, 5ZZ, 8AM, 8BP, 8CB, 8DG, 8DI, (8DV), 8EN, 8ER, 8FN, 8FT, 8HA, 8ID, (8IK), 8JJ, 8JU, 8KP, 8ML, 8MT, 8NI, 8OJ, 8PQ, 8SH, 8TT, 8WY, (8XK) mod. C.W. and fone, 8ZA 8ZB, 8ZD, 8ZG, (8ZW), 9AA, (9AAC), 9ABI, 9ABZ, 9AE, (9AD), 9AEG, 9AEQ, 9AEY, 9AHU, 9AHS, 9AIG, 9AIR, 9AIY, 9AJ, (9AJI), 9ANQ, (9AP), 9AT, 9AU, 9AW, 9AWR, 9CA, 9CS, 9CW, (9DF), 9ER, 9FF, 9FU, (9GC), 9GP, 9HM, 9HR, (9HT), 9HY, 9IH, (9JN), (9JT), 9KO, 9KP, 9KV, 9KW, 9LC, (9LM), 9LQ, 9MH, (9MO), 9NQ, 9OE, 9OR, 9PI, 9PN, (9WU), (9XM), (9ZC), (9ZN), 9ZQ, (9ZT), (9ZX), NSF, WWV.

(Concluded on page 54)

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QST'S DIRECTORY OF CALLS

ADOPTING the Department of Commerce's list of amateur stations as its standard, QST will publish each month the calls of new stations in each district commencing where the government book stops. To make this possible, amateurs are requested to report new or changed call letters to this office.

FIRST DISTRICT

Gilbert R. Osborne	71 Batavia St., Boston, Mass.	1DBJ
George F. Burton	15 Summer St., Roslindale, Mass.	1DBK
Chester M. Day	44 Bates Rd., Watertown, Mass.	1DBL
Ralph H. Hutchins	152 Spring St., Watertown, Mass.	1DBM
K. V. R. Lansingh	"The Firs", Sunset, Deer Isle, Me.	1DBN
James E. Glynn	965 Plymouth Ave., Fall River, Mass.	1DBO
Louis Greenblatt	9 Butron St., Waterbury, Conn.	1DBP
H. J. McClure	Crishaven, Me.	1DBQ
Sherman Shapiro	23 Elizabeth St., Waterbury, Conn.	1DBR
Paul S. Hill, Jr.	344 Main St., Saco, Me.	1DBS
Fisher Hills	84 High St., Saco, Maine	1DBT
Morton B. Williams	214 Huntington Ave., Boston, Mass.	1DBU
Emery A. Millette	29 May St., Spencer, Mass.	1DBV
Arthur R. Prouty	25 High St., Spencer, Mass.	1DBW
Wesley G. Skibsted	Mason St., Greenwich, Conn.	1DBX
Eugene E. Evans	Egdell St., Framingham, Mass.	1DBY
Tremaine Electric Company	City Hall Sq., Brockton, Mass.	1DBZ

SECOND DISTRICT

Geo. N. Garrison	East Orange, N. J.	2AWM

THIRD DISTRICT

Frank J. Homsher	North Glenside, Pa.	3AAR
Carlice P. Koon	1108 Washington St., Portsmouth, Va.	3ACE
O. A. Hutcheson	418 Glasgow St., Portsmouth, Va.	3ACK
H. B. Bennett	1619 Omohundro Ave., Norfolk, Va.	3ACT
L. A. Roane	511 South St., Portsmouth, Va.	3ACZ

SIXTH DISTRICT

F. Thompson	848 W. Milford St., Los Angeles, Cal.	6AAB
E. Hockenbeamer	721 Arlington Ave., Berkeley, Cal.	6AAC
H. J. Balden	Fillmore, Cal.	6AAD
L. T. Hall	691 Post St., San Francisco, Cal.	6AAE
L. B. Hinckley	Fillmore, Calif.	6AAF
C. A. Coffman	R.F.D. No. 4, Box 140, Anaheim, Cal.	6AAG
C. Baldwin & Max Gardner	R. No. 6 N. Center St., Phoenix, Arizona	6AAH
H. Ambler	1070 10th St., San Diego, Cal.	6AAI
N. C. DeWolfe	206 Ellsworth, San Mateo, Cal.	6AAJ
A. B. Lopez	720 Santa Barbara St., Santa Barbara, Cal.	6AAK
H. Fleur	1540 Palou Ave., San Francisco, Cal.	6AAL
C. H. Wiles	R.F.D. No. 1, Box 57A, Stockton, Cal.	6AAM
Jack Dent	3d & Elm Sts., San Diego, Cal.	6AAN
R. S. Hewitt	3089 Royal St., Los Angeles, Cal.	6AAO
C. E. Peterson	529 Santa Inez Drive, San Mateo, Cal.	6AAP
C. Bane	262 Castro St., San Francisco	6AAQ
C. Zeigler	6355 Dana St., Oakland, Cal.	6AAR
F. F. Moffett	843 Lake St., Reno, Nevada	6AAS
I. H. Brush	546 B St., Santa Rosa, Cal.	6AAT
J. Byrne	28 Union St., Santa Cruz, Cal.	6AAU
V. Elliott	840 Magnolia St., Pasadena, Cal.	6AAV
A. Woolf	1904 Shattuch Ave., Berkeley, Cal.	6AAW
K. Burzell	2705 Mobile Ave., Sawtelle, Cal.	6AAX
P. H. Gilbert	Big Creek, Cal.	6AAY
A. E. Banks	1648 Neal St., San Diego, Cal.	6ZB
W. C. Thompson	Richfield, Utah	6ZH
A. L. Munzig	1017 Tribune St., Redlands, Cal.	6ZJ
A. E. Bessey	Sunnyvale, Cal.	6ZK
A. N. Marquis	649 First Ave., Yuma, Ariz.	6ZL

SEVENTH DISTRICT

Benedict Barr	Mt. Angel, Benedict, Ore.	7ID
C. J. W. Tibbetts	1813 Broadway, Helena, Mont.	7IE
R. M. Dansfield	662 Charnelton Street, Eugene, Ore.	7IF
P. B. Jackson	434 Broadway, Seaside, Ore.	7IG
G. W. Selvidge	4321 Ninth Avenue, NE, Seattle	7IH
A. B. Rotering	Box 43, Glascow, Mont.	7IJ
Harry H. Olson	310 4th Avenue, Seaside, Ore.	7IK
T. C. Hall	1126 Taylor Street, Eugene, Ore.	7IL
L. J. Simms	311 North 27th Street, Billings, Mont.	7IM
A. L. Adams	321 West Main Street, Silverton, Ore.	7IN
H. E. Welch	Route S, Salem, Ore.	7IO
A. A. McCue	Kalwock, Tlaska	7IP
Donald C. Gannon	Central Avenue, Kent, Wash.	7IQ
J. R. Harris	Cohagen, Montana	7IR

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F. W. Lawrence	406 South Crosby Street, Tacoma	7IS
Roy Anderson	Ketchikan, Alaska	7IT
George Mecham	7748 Wilson Avenue, Seattle	7IU
Arthur Fletcher	Woodbine Street, Boise, Idaho	7IV
P. R. Hoppe	633 Willamette Street, Eugene, Ore.	7IW
T. L. Estes	Snohomish, Wash.	7IX
Danzil Cuttler	Vashon, Wash.	7IY
Chas. Burson	1921 3rd Avenue, Seattle	7IZ
O. M. Heacock	Enterprise, Ore.	7ZH
E. R. Mumford	518 Beach St., Vancouver, Wash.	7ZJ

EIGHTH DISTRICT

(Following reissued calls; cancel assignments in Call Book.)

Roy E. Chapin	358 Helen Ave., Detroit, Mich.	8BO
Chas. J. Dorazil	2304 Tampa Ave., Cleveland, Ohio	8CE
Ralph R. Kimes	3034 E. 79th St., Cleveland, Ohio	8CU
Herbert Reich	3000 Berkshire Rd., Cleveland Heights, Ohio	8DA
Stanley B. Gould	4132 Willys Parkway, Toledo, Ohio	8EN
Jas. Penberthy	486 Phila. West, Detroit, Mich.	8FE
John A. McCullough	13915 Potomac Ave., East Cleveland, Ohio	8FX
Carrolls Miller	Olivet, Mich.	8GS
J. Eddy Bromley	301 Baynes St., Buffalo, N. Y.	8LA
Jack Gafill	506 Southfield Ave., Birmingham, Mich.	8NG
Milton Fruehauf	17702 Detroit Ave., Lakewood, Ohio	8TZ
Thomas Quincey	452 Davison Ave. W., Detroit, Mich.	8UG
Howard Wilkinson	1446 Michigan Ave., Buffalo, N. Y.	8ACN
Myron H. Premus	53 McKinley Ave., Kenmore, N. Y.	8AHQ
James P. Turner	681 George St., Clyde, Ohio	8AKM

(Following are new calls.)

Frank Schiestel	49 Richter St., Detroit, Mich.	8AIA
Charles J. Fertick	62 Vincent St., Dayton, Ohio	8AIB
Reuben P. Deihl	Cresson, Pa.	8AIC
Paul Blake	634 Huron St., Cheboygan, Mich.	8AID
Lloyd E. Flagg	158 Anderson Place, Buffalo, N. Y.	8AIE
Robt. Wuerfel	R.F.D. No. 8 Miller Ave., Ann Arbor, Mich.	8AIF
Wm. C. Schmezer	75 Amada Ave., Mt. Oliver, Pittsburgh, Pa.	8AIG
Russel Norman	304 Sherman St., Clarksburg, W. V.	8AIH
Seneca M. Dotterer	134 Defiance St., Leipsic, Ohio	8AII
Hamlin R. Fordyce	218 West 12th St., Cincinnati, Ohio	8AIJ
Fred Pickel	164 Pingree Ave., Detroit, Mich.	8AIK
Stuart W. Seeley	Grand River Ave., East Lansing, Mich.	8AIL
Wm. J. Jones	2729 Perrysville Ave., Pittsburgh, Pa.	8AIM
Robt. J. Parker	164 Church St., Buffalo, N. Y.	8AIN
Clarence W. Dalzell	212 Spring Ave., East Pittsburgh, Pa.	8AIO
C. Bosworth Johnson	1526 Quarrier St., Charleston, W. V.	8AIP
Robert Slusher	612 W. Pearl St., Wapakoneta, Ohio	8AIQ
Earl Field	10305 Olivet Ave., Cleveland, Ohio	8AIR
Harry C. Baldwin	14 Odell St., Union City, Pa.	8AIS
Garnet S. Solomon	Main St., West Cairo, Ohio	8AIT
William B. Hanlon	5818 Rippey St., Pittsburgh, Pa.	8AIU
Bertel J. Nelson	408 Orwell Way, Pittsburgh, Pa.	8AIV
Stanley Stevens	416 Railroad St., Bloomsburg, Pa.	8AIW
Geo. D. Bauer	6 Wilmer St., Rochester, N. Y.	8AIX
Paul O. Simcox	705 Clark St., Cambridge, Ohio	8AIY
Hugh T. Smith	123 Springfield Pike, Wyoming, Ohio	8AIZ
Glenn L. Martin Co.	Cleveland, Ohio (Correction)	8XC
Camp Greenbrier	Alderson, W. Va.	8XF
R. C. Corderman	Carnegie Inst., Pittsburgh, Pa.	8XN
Pittsburgh Wireless Equip. Cp.	202 N. Broad St., Ridgway, Pa.	8XO
University of Pittsburgh	Pittsburgh, Pa.	8YI
C. J. Murray	718 West Fair St., New Philadelphia, Ohio	8ZA
E. S. Ensign & W. P. Van Behren	923 W. Bancroft St., Toledo, Ohio	8ZB
B. P. Williams	3220 Orleans St., Pittsburgh, Pa.	8ZD
Edw. Manley	506 7th St., Marietta, Ohio	8ZE
M. H. Pancost	818 Penn St., Lansing, Mich.	8ZF
C. M. Howe	Madison Rd. & Erie, Cincinnati, Ohio	8ZH
Edw. I. Deighan	5415 Hermann Ave., Cleveland, Ohio	8ZP
George M. Withington, Jr.	Marietta, Ohio	8ZT

NINTH DISTRICT

Donald L. Hathaway	1575 Pennsylvania St., Denver, Colo.	9AMB
Roy H. Collins	701 E. Miller St., Bloomington, Ill.	9ANX

MORE "CALLS HEARD"

Following calls heard at 1HAA, VERMILYA, MARION, MASS., October.

(1AK), (1AW), 1AS, (1AAU), (1BB), (BBL), (1CK), (1CM), (1CZ), (1CBP), (1DY), (1DQ), (1DR), (1EAV), (1EP), (1FBF), (1FR), (1FBV), 1FS, 1GBY, 1GY, (1GZ), 1HF, 1IA, (1IS), 1KAQ, 1KAZ, (1KAY), (1NAQ), (1OAD), (1OE), 1OJ, 1PAW, (1QAV), (1RV), (1RZ), (1SN), (1SAS), T1S, 1UAP, (1UAG), 1VB, (1XX), (1XD), 1YB, (2ADD), (2ARY), 2AIM, 2ARS, 2ARY, (2ADM), 2AM, (2BK), (2BM), (2BG), (2BB), (2DA), (2DI), 2DS, (2GR), (2HN), (2JZ), (2JJ), 2KX, 2KN, (2OA), 2OM, (2RK), 2RM, (2TZ), 2UE, 2WG, (2WB), 2XJ, 2ZM, (2ZL), 3AB, 3ACS, 3ABD, 3BZ, 3BH, 3DH, 3DR, 3EH, 3FB, 3FR, (3HJ), 3KM, 3VV, (3ZA), 4CK, 5ZC, 8ACF, 8ABG, 8CB, 8DI, 8ER, 8FO, 8HH, 8HP, 8HA, 8ID, (8JS), 8LF, 8MT, 8MB, 8NN, 8OJ, 8PQ, 8SH, 8VY, (8NG), (8XU), 8XK, 8ZC, (8ZD), 8ZG, 8ZW, 8ZX, 9AEG, 9CP, 9LC, 9UU, 9ZJ, 9ZN. Canadian (3Z) or (2CI new call), (NSF), WWV.

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Radio Communications by the Amateurs



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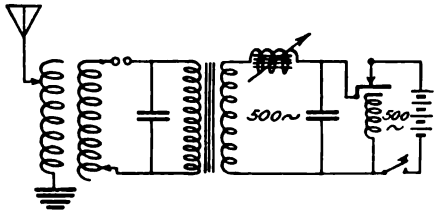
DATA ON SPARK COIL SETS

207 North 11th Street,
Newark, N. J.

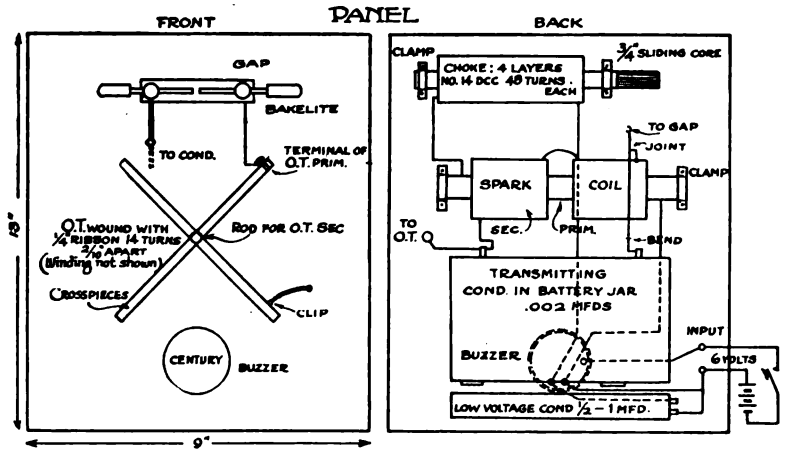
Editor, QST:

Just a few words about Ye Ancient Squeak-Box and of the work done with them by members of the Essex Radio Club.

With a tuned set, using a Century buzzer as an independent interrupter, and obtaining a 500 cycle note, distances from 10-20 miles were covered with an input of 8 to 10 watts. Better radiation has been obtained in later tests using the buzzer in the "resonance converter" method shown in the accompanying diagram and sketches. The idea is to obtain resonance between the low potential circuit and the buzzer frequency. This is done by varying the impedance of the choke coil until minimum sparking at the buzzer contacts, and maximum output, are obtained.



Again, with a low frequency tuned squeak-box, 8-10 miles was covered with about 6 watts input. In this set special care was taken to obtain short leads in the OT primary circuit. All leads, including the primary and secondary circuits of the OT up to the aerial switch, were of ¼" brass ribbon. The condenser leads were about 1" long and the other lead from the gap to OT not over 4". This was possible because of the compactness of the condenser used, which was made up of a few plates of a Dubilier Protective Device, Type CD-694. This made a very small condenser suitable for the ¼" coil it was used with. The OT was designed with particular care, a novel feature being the use of two secondaries separated about 1" but mechanically and electrically joined. Both were in inductive relation to the primary, and in this manner a greater number of lines of force were cut by the secondaries. Because of the shape of the magnetic field, the secondary nearer the primary was larger in diameter. (Why not a secondary on each side of the primary, then?—Ed.). All the parts were arranged on a small panel. When working, 2" coupling was used at all times, and maximum true radiation obtained. Needless to say, the wave was sharp enough to make NAH and NSD blush for shame.



With the same set using a smaller condenser and a loading coil in the open circuit, signals have been transmitted about a mile on a portion of the lead-in 25 ft. long and 20 ft. high. The wave used was about 180 meters. Good radiation was

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obtained but very few sets in the vicinity were able to get down to some of the low waves used.

Through these experiments I believe it is entirely possible for amateurs to have a small indoor aerial for work on waves as low as 100 meters and with which local communication could be carried on successfully, thus eliminating some of the QRM on 200.

Yours vs. QRM.,
W. F. Scott, 2PP.

RE THE O. W.'s.

9ZL, Manitowoc.

Dear Warner:—

You're right, Eddy, there are a lot of us hams giving our better halves the "bug". 9FN of Sheboygan, Wis., is starting early, however, and is pounding his intended's ears full of dots and dashes. The other day he asked her to hand him a dry cell from a shelf, and upon lifting it, she said, "Why Melvin, this battery must be real full yet, it's so heavy". Just give 'em time, eh Eddy?

9ZL.

COMING UP!

Chicago.

Dear Eddy:—

You fellows sure pack a wicked Wouff Hong, because I saw it at the Chicago convention—but listen, Eddy, they tell me it's for the squeak box boys. If that's right, I want to say that I think you ought to make another one about six feet long and double action, to be reserved for the 1 and 2KW hams who use full power to work a couple of miles. What spark coil could cause one-tenth the QRM of a 1KW station who slams on full power and then plays with his new Chink Key? 73 OM.

9QSX.

NEW KINDS OF QRM

Mansfield, Ohio
Oct. 25, 1920.

Editor, QST:

On a recent trip to Pittsburgh, Pa., Uniontown, Pa., Connellsville, Pa., and Wheeling, W. Va., in which places the writer visited 8XN, 8MT, 8AJP, 8WR and 8ZW, it was noted that at each station several different kinds of QRM, similar to that here at 8HH, obtained.

We had been taking it for granted, here in Mansfield, that this interference was something local, and never thought to mention the subject to other amateur stations. 8ZW was quite surprised to find that we had certain given kinds of interference here which were exactly like that which he had in Wheeling. Certain of these types of interference can be accounted for easily, while others are hard to locate. One type which I have just recently run down is that due to the operation of railroad signal devices at road crossings. These bells, when operating, give a "click, click" in the set which lasts for several minutes. Altho 8HH is probably a mile and a half from the nearest railroad crossing, this interference is received plain enough to be bothersome while copying distant stations.

There is another type of interference, however, which was heard at each of the stations referred to above. This type has a rolling, spitting, snapping and sizzling characteristic. It starts up out of a clear sky and has a duration of from thirty seconds to several minutes. This type of interference is received both summer and winter and seems to have no connection with static, as it was received at 8HH all thru the winter of 1919 and 1920 on cold, crisp nights when no static was present.

I might also mention that some of the Pennsylvania amateurs, with whom the writer talked, stated that some of their friends had tried to take the direction upon this type of interference, but had only met with failure. This conforms with the line of experiments carried on here, and would tend to indicate that it was not caused by power lines, etc. It is received just as well when all power lines within a radius of eleven miles are shut off, as when they are turned on.

This is certainly an interesting subject and if you will print a little article in QST about it, perhaps some of the fellows may be able to compare notes which may lead to the final solution of some of the QRM problems.

Very truly yours,
C. C. Endly.

(Editor's Note: The class of interference mentioned in Mr. Endly's third paragraph is familiar here in Hartford, but we have no suggestions as to its nature except that we believe it to be atmospheric and not artificial. It is not a nightly occurrence, but is often experienced several times in one night, and on nights otherwise without atmospheric disturbance. It gives one the idea that a heavily charged cloud is drifting thru the antenna, and discharging, starting gradually, reaching a steady intensity which lasts for ten to forty seconds, and tapering off to silence. The noise during the discharge is terrific. We have had it on beautiful starlit nights without a sign of a cloud; it is faster than the clicks of a snow-storm and not as fast as the discharge of a cloud of steam; and it is not our antenna series variable breaking down.

Let us see if we can't get at the nature of this thing thru our membership. Will anyone who has any data on the subject please communicate with the Editor?)

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THE OHM-SAW, PLEASE!

6 Livingston Ave.,
Yonkers, N. Y.

Editor, QST:

Seems to me that something is flukey, since that September QST arrived. I'd like to ask a question—how do you get those five amps out into the ether, anyway? Gee, I hear about 5, 6, 7, often 8, even 9 amps being discussed as tho it was your fault if you couldn't do the same. Right, eh? Will somebody please explain? Here's why I'd like to get some dope.

I have a 1 K.W. Packard, .007 Dubilier, 120 cycle gap on a synchronous motor, usual O.T. The aerial is a 4 wire, 80 foot T, five feet between wires, approximately 55 feet high. The ground probably is like a tin can along side of 1AW and 1HAA, but it's not so bad. Now the sad part—that dawgone meter won't go beyond 2.8 amperes no matter what I do! With five inch coupling it drops to 2.6 amperes, and the decrement (obtained with a wavemeter-galvanometer combination) is .08. What's the answer?

The other day I got disgusted, and we started monkeying with radiation resistance—that is, "we" includes another in the same boat.

Well, we got something after a while. My output is about 70 watts, his is 135! Good—7% and 13.5% efficient. And we're just normal stations at that.

Maybe it's the receiving stations who are doing the good work, I don't know. Nevertheless, I'd like to shake hands with anybody who gets an efficiency of 20%! And say, if you happen to be the man, for heaven's sake give us a little dope on how it's done.

73—
Carl E. Trube, 2BK.

WHO IS HE?

Bridgeburg, Ont., Can.

Editor, QST:

In the interesting letter in QST of June 29th by our mutual brother Heydon, the latter, after straying far from the subject, landed rather heavily on my toes. I refer to his remarks regarding VAL. As I had the pleasure of assisting in the installation of the C.W. set there, I may rightly assume to know something about it. This station—or the C.W. apparatus in it—is loaned by the British Admiralty, and is operated under contract by the Canadian Government. (not Marconi Co.). This of course puts VAL under the British flag (even if its location in Nova Scotia did not effect that very desirable condition) and so I cannot see wherein consists the violation of the Convention rules—and by the bye: do certain American coast stations get this 800 m. and similar stuff, in the Convention rules? I have no recollection of such liberty being accorded in the Rule Book.

May I also record myself as in support of Mr. Heydon's defence of the great American Noise Maker. It's the man behind it, and not the gun itself that causes QRM. Half the QRM in my district is caused by "power" sets; and let us not forget that (tho' I am **not** one of them I speak on their behalf) many a good station can boast the use of a Ford coil or similar device in working DX (refer QST's Calls Heard). I almost nightly hear an amateur, presumably in Buffalo, whose station must be something like this: power at least 1 K.W.; cycles, 25 or less; condenser (owner's query: "Do they use condensers in sending sets?") nil; coupling inductances, (query: "W'ats them?") nil; spark gap, two 8d nails on a board; aerial, about 60' high and 160' long; receptor, maybe (I doubt it); operating speed, about 3 w.p.m. Operator haasn't learned to make dots yet....and then they wonder why Buffalo amateurs can't work Canadian 3AB! No spark coil on earth could liberate such aperiodic static as is let loose every few nights and for a couple of hours at a time, by the above mentioned Buffalo (?) "amateurs". I don't believe that amateur's identity is known, although three live amateurs with D-F loops would soon locate him. This QRM is the kind we all want stopped—and all know how to stop.

Why don't we do it? Are we afraid, or just lazy? Let's quit knocking the spark coil and get after the QRM. For spark coil and QRM are not the same thing at all. QRM is the radio-fan's international abreviation for "ignorant operator wkg.". Let's get rid of him.

Now Eddie, I too have strayed farther from the subject and will stop before I get lost. Hope I haven't taken up too much of your highly valued time O.M. So wishing continued success to QST

I remain
Sincerely,
Chas. A. Lowry.

(If this punk is in the United States, a can should be tied to him until he gets his set and his ability within the legal requirements. Get busy, Buffalo, and see if he can't be located and educated.—Ed.)

CONSIDERATION IN OPERATING

S.S. Coppename 10/3/20
At Sea.

Editor, QST:

Just finished clearing my hook to Swan Island and will now tell you all about my troubles.

This game is all OK but I want to say right now that the boys at home sure are lucky. You can 'holler' yer block off and when you try to get an OK for your nine

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hours hard labor of pushing a thirteen pound key you will always find some bird testing.

I always went straight up in the air when I got busted up when trying to work some of the boys at home but believe me the QRM on 200 meters can't hold a candle to the 'junk' that is continually floating around on 600 meters. Of all the places in the world the Gulf is the place where some of our most beloved operators take advantage of the missing Radio Inspector and proceed to test out Mr. West's theory of the brushing antenna. Just a few minutes ago one of the Shipping Board Ops tried the experiment by laying a book on his key and proceeding (I guess) to stroll out on the deck to see if he was getting a brush off his antenna.

Of all the rotten dope this is the limit. It is a blessing that the Old Man doesn't have to sit out here with his hook bulging like a poisoned pup and listen to some of this dope going thru the air. I have grave fears that his pet pussy would never survive the initial night..

There is still one thorn in my side that I'll have to get cleared and then will let you rest in peace. That is about the question of the proper kind of MSGS that the A.R.R.L. wants to have going thru the air. One of the rules says no more "Greetings via Radio". That's me all over. The com ops have trouble getting their msgs. thru on practically the same reason; that some darn crank wants everybody to know that he is out at sea or don't know what to do to pass the time away so helps the opr on his ship keep things stirred up. You boys up there at Hartford can't please every one and inasmuch as the rule now stands let's don't back down. As far as Mr. Williams' letter goes, I appreciate his point but don't believe that he has the proper conception of what the word commercializing means. That is a big word and means a lot. If more of the big radio companies could boast of a real commercial system then there would be a pointer for the A.R.R.L., **BUT** as far as commercializing, the A.R.R.L. should have law and order and give these other people an example. We have set a good example in lots of cases so let's keep up the good work. Another thing, Mr. Williams states that his messages were not delivered. He should not blame the rules of the A.R.R.L. for that but rather the inefficiency of the operators on his relay route. Again I say that the rule is **good** and should be enforced to the limit.

As far as the life in the Merchant Marine is concerned it is monotonous true enough **but why** make the life of Amateurs like it by filling the air full of bunk??????

I fully expect to return to the amateur game next winter and I certainly will be disappointed if I hear the QRM on 200 that I am hearing out here on 600. **90%** of the QRM is caused by unnecessary conversation and I am a firm believer that the operator that listens in more than he transmits will get a whole lot further and help others out at the same time by keeping QRM at a minimum.

Last trip this ship was in a hurricane and I want to say right now that all the QRM from ships did interfere with the copying of storm warnings etc.; but I got all of the weather by laying low and waiting, while other ships called and raised hob to get a report on the weather. I feel positive that if the boys at home would follow this rule they would find no trouble in working over greater distance than they had ever expected. The old saying "It is more blessed to give than to receive" DOES NOT APPLY IN RADIO, SO WHY TRY IT?

One thing more; if you call a station and say QRU and he answers you "nil", why litter up the air with useless gabble such as "how is my tone", etc.? Nine times out of ten the other fellow will tell you first "QSA" and if there was anything wrong he would tell you. At the same time while you are squawking about tone some other fellow is trying to be a REAL RELAY STATION and trying to clear his traffic so WHY continue to block his efforts and give a bad eye to the A.R.R.L.?

Let's all be a little more considerate of the other fellow. Radio is not a plaything, neither is it any longer a pastime. It is serious biz and let's treat it as such.

Hoping to be with you in the air soon, I send 73's to all.

M. B. Lowe.
(9LP—KDF).

MORE ABOUT XAJ

5XA, Auburn, Ala.

Editor, QST:

In reading over Mr. Walleze's article in the August QST about "XAJ", it strikes me that he exaggerates considerably and I'd like to give the readers of QST a little more correct impression of this station. To do so, I am enclosing two pictures of the old XAJ. The first is of the old cathedral, between the towers of which the "T" type is stretched. The other picture is of the station proper, which I was able to obtain by the use of a little diplomacy!!!

I can not refute the statement concerning the rating of the transformer, but the generator was rated at 3 K.W. (By the way, after transmission, this generator was stopped by an attendant bearing against the shaft of the m.g. set with a beam of wood used as a brake.)

As can be noticed in the picture, the condenser (Leyden jars) run thru the table down to the floor, but the quenched

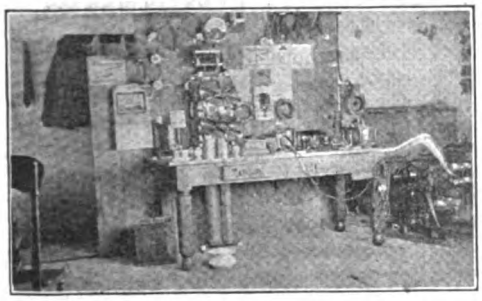
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gap is mounted directly above the condenser and the O.T. directly in front with



the primary nearest the gap. It seems to me that this makes for quite short leads in the closed circuit (which as everyone knows, is the circuit in which short leads count for most). Perhaps the connecting leads are not as large in proportion as those of our first-class amateur stations, but who has seen a commercial station (especially one built ten or fifteen years ago) whose leads are as large?

It may be that the room had just been cleaned up before I entered it, but at any rate, at no time did I ever see all of the



leads scattered over the walls, floor and ceiling as Mr. Walleze so graphically describes it (and it may be said here that during the year 1917-18, I was running into Tampico—on KRG & KGS—and I visited this station not less that twice a month).

In closing it might be said that this station is now 'no more', it having given place to a newer more modern station—which does not do as good work as the old one did!

Sincerely,
V. C. McIlvaine.

CONCERNING CAGES

Fall River, Mass.,
QST, Oct. 28, 1920.

Gentlemen:

I wish to comment on cage antennae as published in QST, October, 1920.

I have used a 4 wire cage since the war and find a few flaws in the article as published. In the first place, all wires being equal in length, the cage will roll and twist—but if the two or more upper ones are somewhat shorter it will maintain its shape when sagging in the middle as all aerials are bound to do. I use wooden hoops with cross wires like a wire wheel and circumference wires, all soldered together. If instead of the cumbersome insulators at the end, all antennae wires are carried to a common center at at the lead in end and one or more good insulators installed, much less strain is imposed on the whole construction.

Hoping the above comments are of some value, I remain

Yours truly,
Wm. H. Buffinton, 1GZ.

REPRODUCING BALL LIGHTNING

424 Hamilton Natl. Bank Bldg.,
Chattanooga, Tenn, Oct. 12, 1920.

Editor, QST:

My brother and I have been interested in building and operating some large Oudin and Tesla coils, more for the spectacular effect than anything else. While tuning up one large Oudin coil (stands about 4 feet) we had it grounded to the steam heating pipes of the building which passed directly behind the coil. The power was operated by our radio key, in fact the radio transmitting set was used. My young brother was standing with his right hand on the key and with his left, fingers up, palm extended, towards the large copper ball on top of the coil. Before he had moved his hand close enough to receive the discharge from the ball a "spark" or "fireball" broke from the STEAM PIPES, passed within about 12" of the copper ball and struck the boy on the palm. He received quite a jolt from this but nothing serious. Later he lost the skin from the palm of his hand. I could not get a good look at the "fireball" from where I was standing. We thought the matter was more of a joke than anything else and paid no attention to what really had happened.

(Continued on page 64)

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GIFT BONDS

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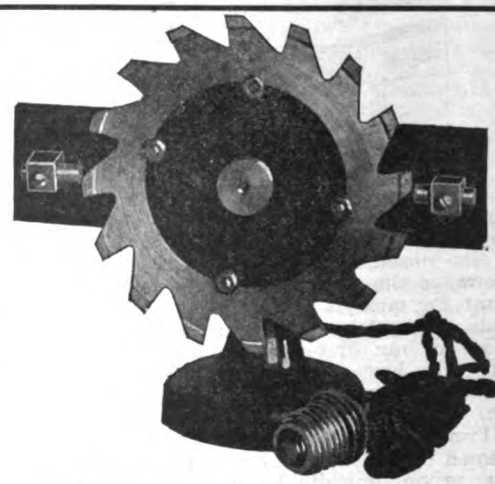
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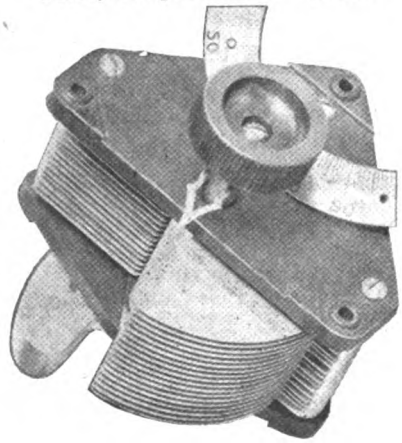
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CAT. NO. YM-10

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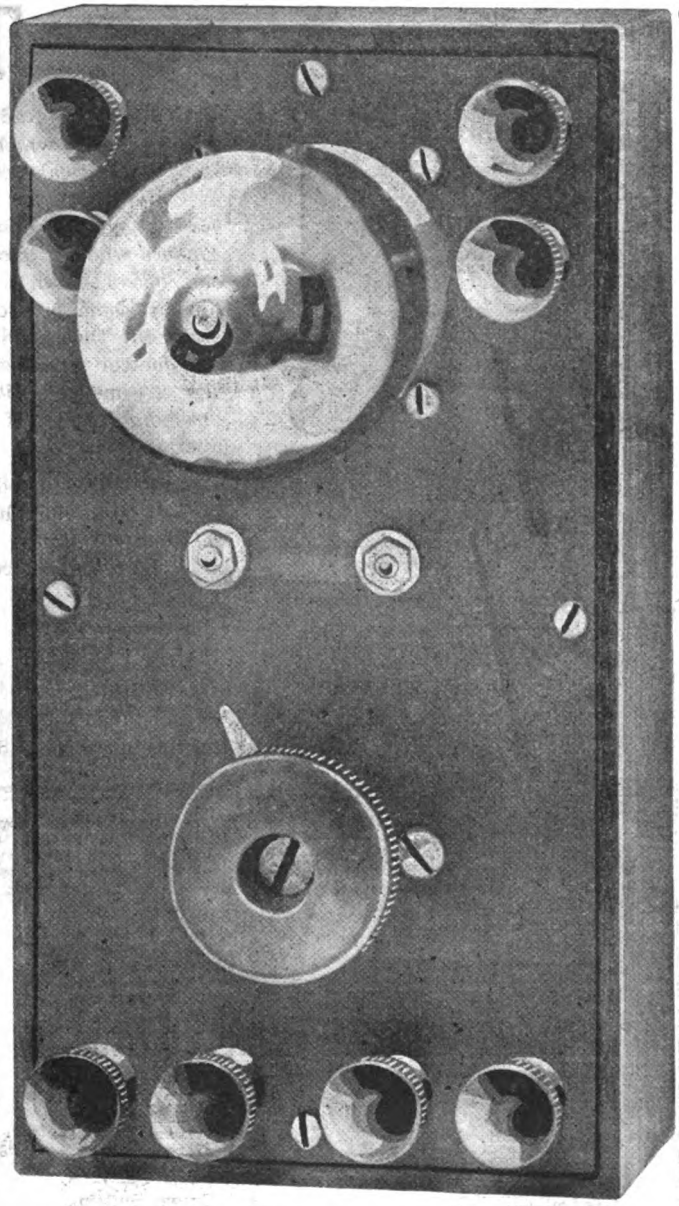
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Vacuum Valve Detector Cabinet—Cat. No. YM-8

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The "Big Midget" is the smallest audion cabinet, to our knowledge, which is now being offered on the market. All parts of this cabinet are of standard type, and assembled to make up the ideal audion for amateur use. The illustration herewith shows the instrument in its actual size. The cabinet has a depth of two and one-half inches. Finished in "Early English" quarter-sawed oak, it presents an appearance that will make a welcome addition to any station It is furnished without "B" or "A" battery, and any of the modern type bulbs may be used It includes a rheostat of the smoothest running quality obtainable, a fixed mica condenser, a variable grid leak, standard VT socket, hard rubber binding posts, oak cabinet, and grained bakelite panel.



$12.50
Without bulb or "A" and "B" battery.

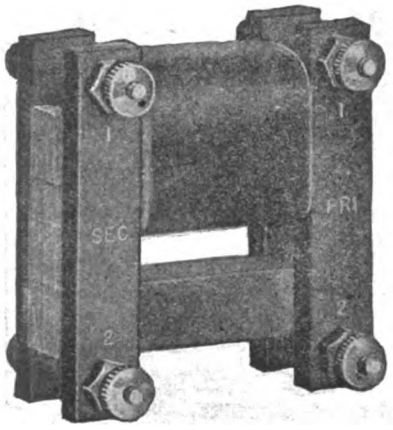
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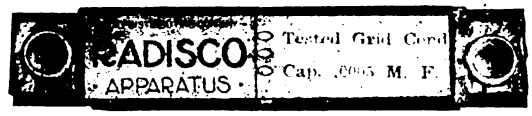
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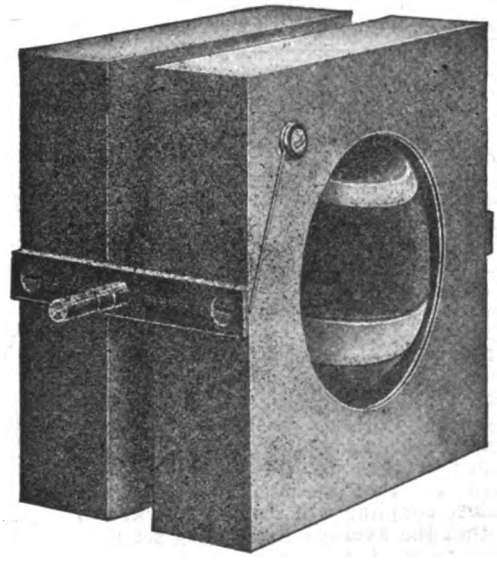
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Another Radisco product, tho small in size, very large, indeed, in service. Of simple and effective design and construction; takes a minimum of space in audion control work. Its special construction permits the sale of a really efficient instrument at a very low price.

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Sometime later we had moved the coil several feet from the pipes and were again operating it. This time I was operating the key with the boy looking on. Another spark of "fireball" came, this time from the copper ball on top of the coil, and passed directly towards the boy, striking him in the forehead. He received nothing worse than a bad headache from this one. I was standing so that I had a clear view of the entire action. The ball appeared to be about ⅞ inches in diameter, very white, and was sparkling. It traveled fairly slowly, that is, so we could see it plainly, but a little too fast for the boy to dodge well. Now I would like to know what these things were—has anyone else seen anything like them? I cannot understand why they should ignore closer objects and people and pick on that brother of mine. Maybe they do not like him.

Any assistance you can give me will be very much appreciated.

Yours very truly,
Benj. F. Painter.

NAVY QRM

2637 Garfield Street N. W.,
Washington, D. C.

Editor, QST:

I wish to support heartily your statement on page 46 of October QST that Mr. "D. B." is mistaken in saying that a quencht gap station cannot emit a broad wave. Not only can it emit a broad wave but the most notorious offenders in that line today are quencht gap stations. This is logical when the design of the apparatus is considered.

When a quencht gap is functioning properly, very close coupling can be used; consequently the sets are so designed as to permit that close coupling. If then thru ignorance of the operator the set is maladjusted so that quenching ceases, the same close coupling will result in a wave so broad that the average rotary gap set cannot hope to rival it.

The most usual mis-adjustments are: wrong generator voltage, wrong generator frequency, wrong number of gap sections, and wrong coupling. The coupling especially is critical and as the editor has pointed out, wave changers do not always provide adjustment for this.

In general a bad note goes with defective quenching and the station with the broad wave also has a "mushy" quality.

Should Mr. "D. B." desire examples they can be had at New York. Tune in first the rotary gap of WCY at Cape May. The wave is sharp and while the maximum intensity is tremendous the station can be tuned out. This is a rotary gap.

Take next NAH-1, the Brooklyn Navy Yard, next after NAM the most notorious QRM maker on this coast. The tone is not clear and the wave is vastly broader than that of WCY. Here at Washington NAH-1 is about half as loud as WCY yet it cannot be tuned out with anything like the same ease. This is a quencht gap set —evidently badly adjusted, about as badly as possible.

That a quencht gap set can produce far different results is shown by WCG, the Bush terminal in Brooklyn. The beautiful clear whistle of this station is very considerably louder than NAH-1 yet its tuning is so sharp that even at waves very near its sending wave there is no interference (at Washington) from WCG.

I should like to have decremeter measurements on the antenna currents of the stations named.

The trouble is not at our tuners, it is at the coastal stations, especially at those star offenders NAM and NAH-1.

Sincerely,
S. Kruse.

RADIOPHONE CONCERTS

Union College Radio Club,
Schenectady, N. Y.,
22 October 1920.

Mr. Kenneth B. Warner,
Hartford, Conn.

Dear Sir:

The Radio Club at Union College, Schenectady, N. Y., is transmitting a radio concert every Thursday evening from 8:00 to 8:30 and from 9:00 to 9:30 Eastern Standard Time, on 350 meters, signing 2ADD.

We radiate over 3 amperes with five General Electric "V" Tubes. The Club would be greatly obliged if you could print this notice among the "QST" pages in an early issue.

Respectfully yours,
Jetson O. Bentley,
Secretary.

Address mail:
Jetson O. Bentley
Lambda Chi Alpha House,
22 Gillespie St.,
Schenectady, N. Y.

'TWAS EVER THUS!

KOSR, At Sea.

Editor, QST:

Did you ever stop to think what a vast amount of information you give, free of all charges and encumbrances, when you whisper your worries and discoveries to the man behind the counter of the "Home Paradise" or whatever its name may be—your favorite wireless store? Or what wonderful startling things the files of a mail order house would disclose? If you can't work in such a place then just try lingering near the counter an hour or two

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some Saturday in the busy season and keep your ears open; it is far better than any vaudeville ever seen. Unfortunately it isn't all fun for the man who has to keep a straight face and show the budding wireless wizard the error of his ways. For instance think of the pathos that must be registered when Marconi Junior discovers that the man at the store was right after all and that a tuner wound on mother's best rolling pin **really won't** bring in signals without the aid of a detector or some other mysterious device! This is the bugaboo of both retail and mail order departments: explaining to an ever-changing group of hopefuls what a set won't work without and answering the next question that invariably follows—"why not".

Then there is the goof who wants some "110 volt fuse wire". He always wants it for general use around the attic, to protect all kinds of instruments known (and others which are in process of construction) but has no idea how much current he wants to use. He usually admits he doesn't understand about the amperes and such, and reverts to his request for fuse wire that will carry 110 volts safely.

Next, in a great hurry to be waited on, is a gentleman who was commissioned by his son to buy "an interrupter for a vibrator". Oh, yes; perhaps it **was** a vibrator for an interrupter but it must be one of the two. "What, you haven't any? Why he told me you were the best place in the city and that you would be sure to have it. Yes that is what he wants, you can't shove anything else off on me. Well, I guess I'll have to send him down for it himself. Good day."

This man was easy but wait till mother comes in with a list of what her darling son wants. Of course he took the prices from last years' catalog because they are so much more reasonable than the new ones, and woe unto the salesman who asks more than Willie had written on the slip as the correct price, for he then becomes guilty of trying to take advantage of a lady who doesn't understand wireless goods. We get along as well as possible, thinking longingly of the good old wouff-hong in the back room—but no, it is impossible. This is a lady we are dealing with, but oh boy, if Willie would only come in himself. So we finally arrive at the fourth item, which (after deciphering) turns out to be nothing more imposing than a Geissler tube to operate on 110 volts A.C. Then the conversation takes a turn like this: "Then you haven't any? Where **can** I find them? What! aren't made! Oh they must be; you are just telling me that because you are out of them." Then comes the clinching argument: "Of course there must be, or else why would he be wanting one?" Did you ever try to convince, or even intimate to a fond mother that there was something about wireless that sonny, who has a **government license** (this always heavily emphasized), doesn't know? Just try it some time! It's high treason, an insult to his as well as the mother's intelligence and poor business in general.

The young man with the glasses, knowing we cheerfully furnish information, wants to know what capacity to use in the tuned plate circuit to make his V.T. oscillate well on 25,000 meters; he also wants hook-up for radio frequency amplifier using common A and B batteries. After taking his address and his thumbprints and making all kinds of dire threats we loan him a French booklet with the desired diagrams,—which scrap of paper was jealously guarded and so escaped some eleven or nine "final" inspections and two or three cootie mills.

Here comes a youngster with a woebegone look; he must have been hooked up on the wrong side of the meter when it happened. But no, his trouble is still graver. He just received his new P—— transformer and it doesn't work. He has carefully connected the city juice line through the key, **to the big porcelain insulators** on top of the thing, where the safety gap is, but when the key is pressed there is no result beyond a funny little humming noise. True, he didn't know quite where to look for the spark but then there should have been a spark somewhere shouldn't there?

We consider our time valuable so we pass this fellow over to Bill to enlighten and go over to take care of the heavy set man who looks as if he knows exactly what he wants. He does. First he asks us in a scientific way whether a bell can be rung by wireless. Of course it can. Visions of going out to set up a demonstration set at some school. Hope it's a co-ed school; here's where I slip one over before Bill comes to see what's up. I wonder if this guy is a professor or a newspaper man, if the latter I must duck for I am so bashful and hate publicity. OH YES! Then the man unfolds his scheme. He merely wants us to install an outfit to ring a bell by wireless (we just said it could be done) in his home. It is his clever idea, he is going to thus do away with the annoyance and expense of renewing his DOORBELL batteries by ringing it by wireless. This is too much! We barely recovered in time to sell him a bell transformer before he escaped, then with a strange buzzing noise in our ears we went to the office looking for action. First we handed in our resignation from the firm, expressing a hope that business would remain as good as was possible with the star salesman gone; then we dictated a letter to the district radio inspector asking when we could be examined for commercial license.

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So we are now sailing the briny deep, going to sea at irregular intervals when the longshore strikes are at a minimum in the various ports we visit. Some day, when V.T's. are a dollar a dozen and we all have money to burn and nobody kicks about the price you ask them for goods we are coming back ashore. We will bring along what souvenirs we can collect from various radio stations, and what we do not use on 8—will be offered for sale at the old stand. Drop in and tell us how you eliminated static and fading, and if we know any bigger ones we will tell them to you—whenever the boss is out.

R. O.

RE QUENCHED GAPS

(Concluded from page 49)

the primary oscillating circuit, a condition almost inevitable wherever straight or ill-designed rotary gaps are used.

A properly designed quenched gap therefore allows closer coupling. This insures a greater percentage of available energy actually put into the antenna and a substantial increase in transmitting range, the emitted wave conforming to Federal regulations respecting decrement.

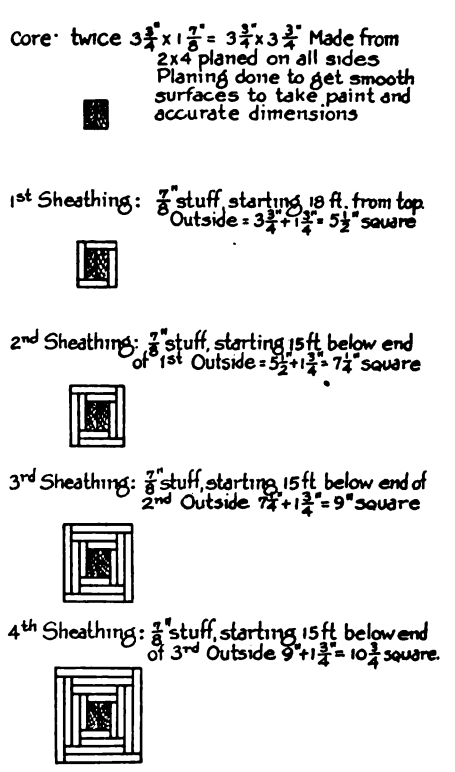
It has been said that a quenched gap operates best with 500 cycle current. This is not in accordance with the facts. Frequency does not affect the efficiency of the gap itself. In the case of 200 meter operation 60 cycle current is much more desirable since the slower period permits a complete charge of the condenser before each train of oscillations takes place. The question has been asked whether it is possible to obtain a good spark note with 60 cycle current. The answer is "yes." A clear, rhythmical note of either 60 cycles or 120 cycles frequency may be obtained by adjusting the number of gaps in circuit and the value of resistance in series with the a.c. transformer primary.

Some quenched gap sets produce a "mushy" note because the operator fails to use sufficient resistance in the primary power circuit. This causes the spark to "arc" in the gap, producing the "mushy" note. The importance of using sufficient resistance in the primary power circuit does not seem to be fully appreciated by a few operators. Figs. 1, 3 and 4 emphasize this point. Fig. 2 shows the characteristic wave form of the ordinary rotary gap.

No special knowledge is required for the operation of a quenched gap. Explicit instructions are included with most of the better types on the market and the operator simply needs follow these. As regards upkeep, the quenched gap has a long life for everyday use—not abuse. It is neither liable to wear out or break provided the ordinary operating instructions are followed.

The Masts at 1AW

SINCE the description of 1AW in the July issue Mr. Maxim has received a number of requests for a description of the masts, which were shown in our cover illustration for that month. The following illustration will explain the construction. The figures are approximate, as the stock varied a little. It was all given a coat of good lead paint before



assembling. All of the assembling was done with the use of 4" galvanized iron spikes, and the completed mast was given two coats of paints. It was then bound around with iron packing-case binding every three feet from top to bottom. The lumber is best quality spruce and the material was sawn exactly to width before assembling. All joints were carefully staggered.

The masts are 80 ft. high and are set on concrete footings flush with the ground. Each mast has three sets of three guys, of No. 6 iron wire, with turnbuckles. All fittings were wrapped around or tied to the masts—no holes were bored thru them anywhere.

Thru artist's error our drawing shows the various cross-sections as slightly rectangular. They should be square.

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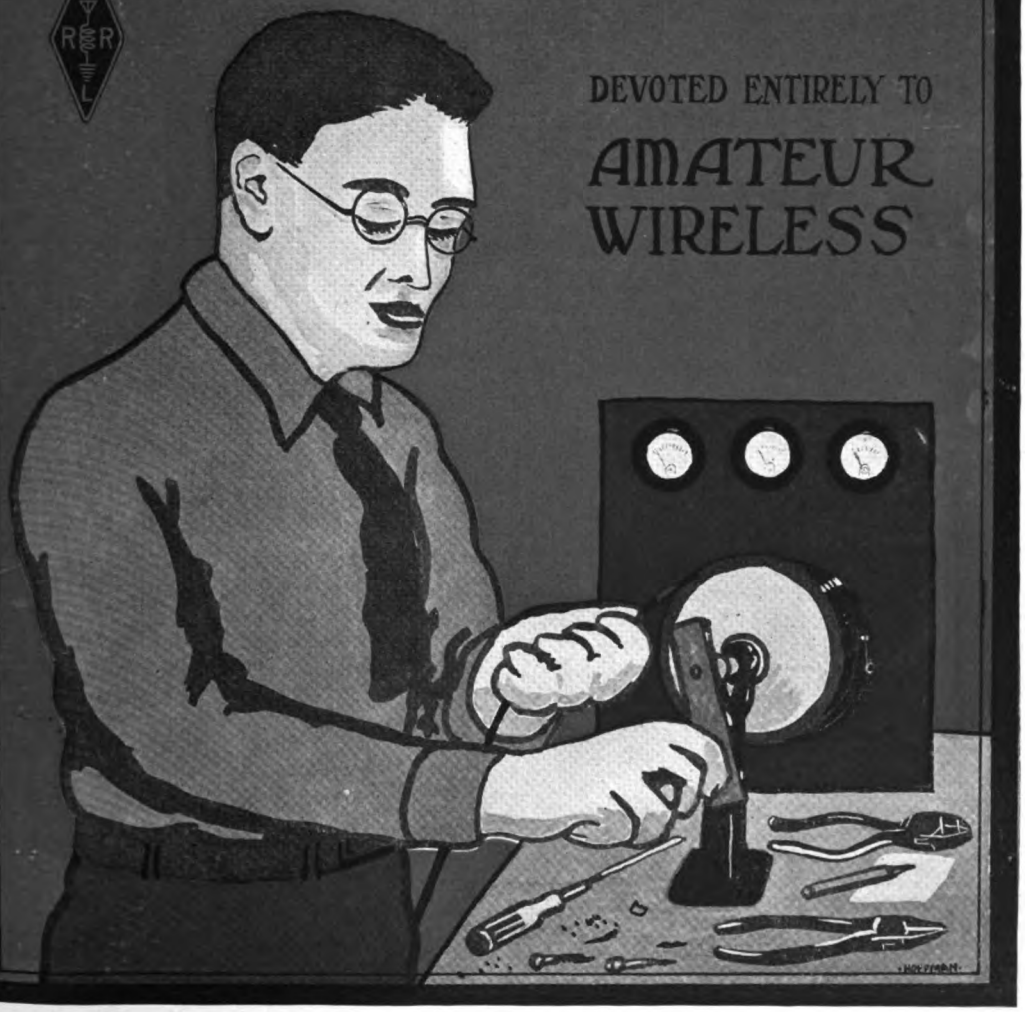
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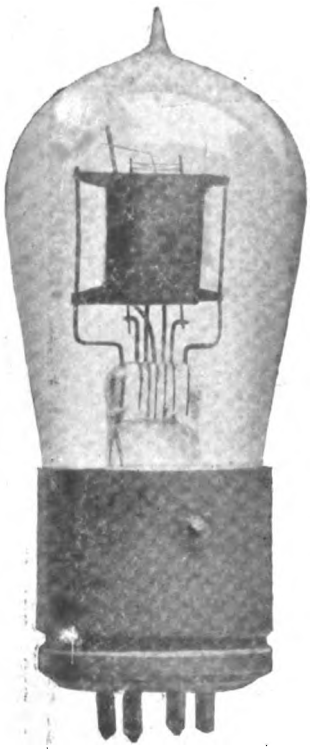
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QST

JANUARY, 1921.

VOLUME IV No. 6

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QST
A Magazine Devoted Exclusively to Amateur Radio

Some Thoughts on Spark Operation

OUR thoughts these days turn largely to C.W. Transmission but it is noticeable that the traffic still goes mostly via spark. We haven't power tubes in any quantity or variety yet, and it's a case of each man building a set around whatever tubes he is fortunate enough to secure, so that to date we have no standardization in C.W. equipment, no definite sort of a C.W. transmitter to hold up as a guide, and our articles on this subject in QST have had to be largely along the line of suggestions which each individual could take and shape to his particular equipment. In the case of spark sets, however, the passing years have just about reduced amateur transmission to certain definite practices which, if carefully observed, will not fail to produce results. The varying degrees of success attained by different amateur stations is more a matter of the degree of thoroughness employed in the arrangement and adjustment of the transmitter, and of the degree to which the different component parts are suited for work with each other, than it is a question of the principles involved, for we can come pretty close to saying what constitutes good design in a spark transmitter. It will be the purpose of this article to outline a few of these fundamentals.

Aerials

The radiating qualities of an antenna depend upon a quality known as its "radiation resistance", and this in turn seems dependent upon two factors, its physical arrangement and the voltage at which it is operated. In Mr. West's article on page 19 of the April QST, and subsequent "Communications", the importance of the latter point was well brought out. Mr. West points out that a good amateur aerial should be as high as possible, should have the center of capacity as high above the earth as possible (with a cage lead-in), and should have a fundamental period materially less than the working wave, with considerable inductance at the base of the aerial, which will result in increasing the effective voltage and in lowering the decrement thru making the aerial system a more persistent oscillator. The voltage on an aerial should be just below the value which causes brushing, if best radiation is to be obtained, and it is pointed out that as the capacity of the antenna system is reduced, the voltage to which it is charged is increased. For any given transmitter, then, best results will be obtained when the capacity of the aerial is so reduced, by gradually reducing its length, that it is just at the brushing point; then adding another

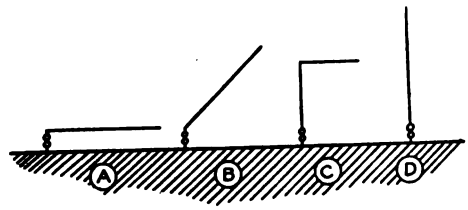


FIG 1

wire in parallel so that brushing just ceases (for when brushing occurs the decrement is greatly increased).

As to the physical disposition of the aerial, we are concerned here with what is known as "form factor"—the feature which makes one form of aerial a better radiator than another. In Fig. 1, imagine we have a certain aerial connected to ground thru a transmitting set at one end, of 100 feet overall length, and free to be placed in any position. If this system is arranged as an inverted L aerial of minimum height, say as shown at A with a height of 2 ft. and a horizontal length of 98 ft., it will have the maximum capacity, the lowest apparent resistance, and be the poorest radiator that this combination can produce. These qualities will gradually change as the open end of the system is raised above the ground as shown at B, or as the ratio of vertical portion to horizon-

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tal portion is increased as shown at C, resulting in less capacity, higher apparent resistance, and improved radiating qualities. When this is carried to a maximum and the aerial disposed as a straight vertical antenna as at D, the system has the minimum capacity with respect to earth, the highest apparent resistance when excited by a transmitter, and the best radiating qualities. This is briefly the theory of the fan antenna and its reputation for good transmitting.

From these points we are led to the conclusion that the ideal amateur transmitting aerial probably would be a vertical

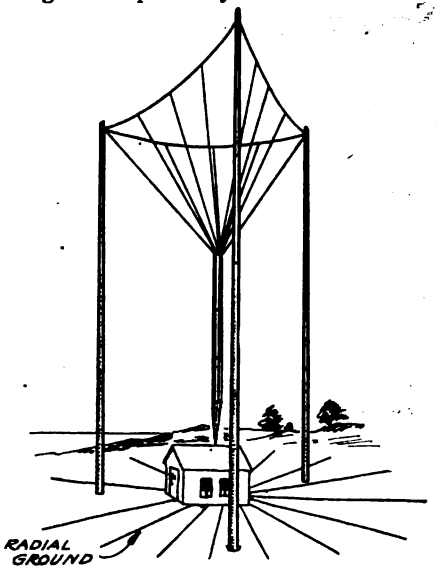


FIG 2

multi-wire aerial of the form of an inverted cone, supported by three towers about 100 ft. high set in an equilateral triangle, with the wires formed into a cage at a height of about 60 ft. to keep the center of capacity high. Fig. 2.

Three towers, set close enough to support an inverted cone aerial, exist only as a dream for most of us, and so in practice we find our aerials are vertical fans, slanting fans, or plain flat-tops, as we can afford. And indeed, when all is said and done, it is quite questionable whether one gets his money's worth from the added investment called for by a vertical aerial when compared with the old reliable T or inverted L type, either flat-top or cage. Most of the vertical aerials are doing admirable work, but many of the flat-tops are also, and most of the fans have been erected by experienced amateurs who mastered the rudiments of the game years ago.

In a general way it is desirable to have an aerial as big as possible, but over-long aerials are the cause of more violations of the wave length law than any other thing, and the desire to get up as much wire as possible should not prevail to the extent that one puts up an aerial with a natural period of 190 meters and hopes to transmit at 200. It can't be done efficiently, but it is fine for about 240 meters—and that's the way some of these stations get the way they are. It is hard to define the proper length of an aerial, as nearby objects influence it, etc., but we believe it can be said as a working rule that for 200 meter work the total length of the open circuit—flat-top, vertical part, lead-in, and ground lead—should not be over 100 feet, for a 4-wire inverted L. The wires should be spaced 4 feet—not 2 ft. Don't worry about directional effect—it is not an important factor until the flat-top length is several times the vertical height. The T aerial is the better aerial theoretically, but the difference is not marked. The effective length of a T aerial is figured by adding the length of the vertical part and one half of the total flat-top length; and, because the other half of the T increases the capacity more than it decreases the inductance, the over-all length can not be as great for 200 meters as in the case of the inverted L.

An amateur inverted L aerial, with a flat-top consisting of four wires 50 ft. long, spaced 4 feet apart and suspended 50 ft. above the ground, with the four wires joined into a cable about 15 ft. below the flat-top and run straight down to the set, and with ground lead only a few feet long, is well fitted for excellent 200 meter transmission.

Just a word about receiving aerials. There is no practical advantage in using more than one wire, and the improved signal-stray ratio of such an aerial over the higher capacity used for transmitting leads us to suggest that general relay traffic would be improved by the use of a single fairly low wire about 150 ft. long for receiving.

Grounds

The ground is the hardest thing in the amateur station to get right. Reams have been written in QST about grounds. There are all kinds of grounds and the average amateur is so governed by surrounding conditions that no law can be laid down except to say that securing a low-resistance ground is a job that requires perseverance and considerable time. It is not true that the best policy is to ground onto "everything in sight". The best ground is one that delivers all the energy to earth at the same instant. It is therefore advisable to bring separate leads from the various ground connections and use the combination that gives greatest antenna current. Counterpoises are hardly advis-

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able in cases where a good connection to damp soil is attainable. If a counterpoise is used, let it be well insulated from earth, for a leaky counterpoise is but an extremely high-resistance direct ground.

Oscillation Transformer

The O.T. must have low resistance, and be readily adjustable in both circuits and in their coupling. The spiral pancake type, with one winding hinged to swing so as to quickly adjust the coupling, is the most convenient type in the opinion of many amateurs, altho admittedly a matter of opinion only. The really important thing is that the conducting path be large enough, and that means lots of surface. A 1 k.w. O.T. with half inch ribbon is a joke—the primary ought to be 1½ inch ribbon and the secondary 1 inch.

Condenser

No attempt will be made here to describe the construction of condensers. They can be made or bought. The mica type is probably the most efficient obtainable on the amateur market, but unfortunately costly. The capacity of .007 mfds. is recommended for average 200 meter work, altho with the right voltage, the right gap, and careful tuning, .01 mfd. can be managed with consequent greater power. Homemade condensers should be immersed in oil to prevent brushing, and every effort should be made to keep the current path as short as possible.

Gaps

The gap is the most interesting part of the amateur station. It determines the note of the signals, and upon its correct design depends more of the station's efficiency than on any other part. Its purpose is to keep open the primary circuit without leakage while the condenser is charging, then to close the circuit with as little resistance as possible for its discharge, and to quickly reopen the circuit when the energy is transferred to the antenna circuit. We have talked so much in QST about the attribute of quenching in rotary gaps that we will not say more about it here than that for good results the gap should have a high peripheral velocity, preferably by combining fairly high speed and fairly large diameter, and proportionately less studs.

Transformers

We have on the amateur market two types of transformers, the non-resonant or constant voltage type, and the resonant or magnetic leakage type. The latter depends on a resonant rise in voltage thru its leakage, and as the time element enters, it is distinctly unsuited for use with a high spark note. Maximum energy per wave train, and maximum antenna current, are obtained with such a transformer with the use of a relatively low tone, the best value to be found by experiment. Lower frequencies do not work the set to capacity, and higher frequencies do not give the condenser time to charge to full voltage. The non-resonant type of transformer, however, is capable of maintaining across the condenser approximately whatever voltage obtains as the product of the turns-ratio and the instantaneous primary voltage, which is to say that the spark frequency may be about whatever value is desired. In this case, as the spark frequency is increased, more power is drawn by the transformer and more actual watts may be put in the aerial, but it is interesting to note that this does not necessarily indicate an increase in range and in fact, in many cases, merely means that the power bill will be larger and that the apparatus will become heated.

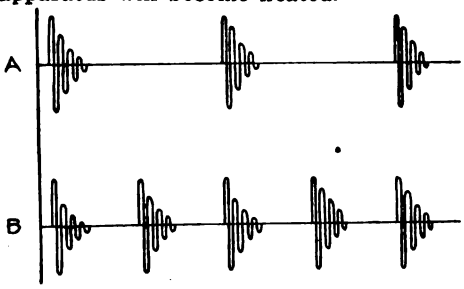


FIG. 3

Let us consider an imaginary transmitter having a condenser of .007 mfds. and a variable speed rotary gap, and using either a magnetic-leakage (resonant) transformer or a non-resonant transformer. With the resonant transformer a certain critical gap speed will be found for maximum output, and let us imagine that at this frequency the condenser is charged to a voltage that all but breaks down the safety gap. The wave trains sent out will then have the maximum energy content PER TRAIN that is possible with this transformer. Running the gap slower will cause the safety gap to break down, and running it faster will reduce the antenna current and the actual power drawn, altho the power factor will be so greatly reduced that the amperes taken by the transformer will be higher and liable to overheat it. Consider now the non-resonant transformer, and imagine that its secondary voltage is of the same value as that of the other transformer when the set was properly adjusted—i.e., all but sufficient to break down the safety gap on the condenser, a comparison in transformers that will be realized in practice, if the non-resonant transformer has the correct voltage for the condenser, by the fact that the adjustments of the resonant transformer for

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best output would be those which duplicated the voltage of the non-resonant one. At the same gap speed as before, the non-resonant transformer will give the same antenna current—it cannot give more, for we imagine in both cases that the condenser is charged to the spilling point, and more than that it cannot be. Now as the gap speed is increased we will find that with this type of transformer the secondary voltage will hold up and the condenser will continue to be charged to the same voltage, drawing more and more power from the line as the spark frequency is increased, until, with this transformer, we realize an input of 1000 watts—which is difficult to attain at ordinary voltages on a 200 meter condenser with the resonant type of transformer. However, and here is a vital point, the ENERGY CONTENT PER WAVE TRAIN will be just the same as in the case of the lower note, and just the same as in the case of the same low note on the first transformer. And it is the energy content per wave train that produces response in the receivers at the other end. Therefore, in spite of increased power drawn by the higher frequency on the non-resonant transformer, the audibility at the receiving station will be no higher, if we neglect the increase in the sensitivity of average headsets and the human ear at frequencies around 1000 cycles. In other words, the additional power drawn, and the additional power radiated has been unable to increase the instantaneous amperes shown by the antenna current meter, will contribute not one bit to increasing the "noise value" of the wave trains, and will do nothing but heat the apparatus except to the rather limited extent that the higher note would be easier to read thru strays or more effective on a certain headset or a certain ear-drum.

Fig. 3 conveys the idea, A representing a wave train of a certain maximum energy content under the imagined conditions using a resonant transformer, and B representing similar conditions, except with spark frequency doubled, with the non-resonant type. The energy content of all the wave trains is clearly the same, but because each train is rectified and applied SEPARATELY to the phone diaphragms, it will be obvious that the increased energy radiated in the case B will in general only double the spark note and not increase the audibility.

From which we see that, in addition to knowing that amperes in an aerial mean nothing unless we know its resistance, and that watts in an aerial mean nothing unless we know the decrement, watts drawn and watts radiated on a given decrement are no criterion of audibility unless we also know the spark frequency—the energy content per wave train— the thing that "makes the noise".

Elsewhere in this issue QST announces a contest for articles on the best practical relay transmitter, which will bring forth for our readers intensely interesting and highly valuable data on how to put these principles into practice.

The Young Squirt's Third Epistle to The Old Man

By QRU

GOOD evening, Old Killjoy. How is your osmosis this evening? I am feeling magnagorgious and hope that you are the same. Everything seems bright and cheerful; my old VT is oscillating, the robins are singing in the November snow drifts, nature has on its belated coat of drab for autumn, and there ain't a rotten thing in sight.

Irving Vermilya is mooching along at a 2:40 clip at WSO and 1HAA, Elmer Bucher and H. C. Gawler have embarked upon a new enterprise to make amateur radio better (and when these birds start anything they usually finish it) Warren Harding and Cal Coolidge have been elected our chief executives, and I have started to shave. So, old Pessimistic Platitude, you see that there is not a cloud on the horizon.

I expected that Eddie would have a "Rotten" story in the November issue of our magazine. As he failed to come coco I have about decided that that dried-up think tank of yours wants a rest, or that you've gone tautog fishing in the Mississippi river. I do not want to hold a dissertation on angling except as it might be applied to whyorless, but I beg that I may hand you this little gem of knowledge. It is this: the way to catch tautog is to whisper in the critter's ear. This, old timer, may be conveniently done with the aid of a five stage amplifier and a positive potential on the fish hook. Please pardon this digression from our shocking subject,

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but I hope this won't prove to be rotten advice.

I was out visiting a brother ham the other evening. This guy is not only a bird of brilliant intellect, he is most distinctly a winged creature of the filliloo variety. After listening to the soothing strain of an inch spark coil for some half hour, more or less, I picked up a copy of our QST which happened to be lying on his table. I was reading the chapter that told of the heroine doffing her #%—&'()—— pardon me, Gloomy, that was another book I was reading. Anyhow, friend ham called my attention to the fact that a "wise guy" had started knocking the Old Man and he ventured it as his opinion that the whole darned proceeding was a blankety blanked shame. He asked me if I didn't think so too. Then the fun started. Ye Gods, the Charge of the Light Brigade had nothing on the line I handed that guy. The argument was somewhat as follows. New York and Boston papers please copy.

"Say," said friend Ham, "have you been reading QST lately?" If that wasn't a foolish question to ask me, I'll give up. So I answered, "Sure, y' darn nut, anyone that wants to be up to date reads QST every month."

This little rejoinder must have hit the old boy right in the thorax, for he was nonplussed for the moment. Finally he piped up, "Wonder who in the name of Diadelus is this guy who is knocking The Old Man? Shooting is too good for the likes of him. They oughta tar and feather, draw and quarter and hang him as high as Haman. Young Squirt! I wonder how he gets that way? Some good natured ham oughta hitch him to the tail end of a step up resonance transformer, coax about seventy-five amps at a pressure of some two hundred and fifty volts to shoot him in the think tank, after which he should be carefully picked up, placed in a concrete coffin and be made to recline beneath the weeping willows. And last, but not least, a bakelite monument should be erected to his memory and it should be inscribed as follows,—"Here lieth the body of The Young Squirt. He squirted altogether too much, the darn skunk."

Oh Boy and Ye Gods, imagine my feelings! I could feel the long hair on the top of my head and the shorter ones in the back of my head rise up in righteous indignation. My vision grew dim but red, shotguns and sledge hammers floated before my eyes, but with the speed of Jamaica ginger I retorted, "Nothin' doing, I think that that prehistoric Dingbat of an O.M. has gone too far. Didn't George Washington say while crossing the Mississippi river, 'Down with the knockers', or words to that effect? Now The Old Man might be a good lookin' feller, he might wear a high silk hat, he might attire himself in gorgeous carmine breeches and might carry a gold headed walking stick and still preserve his equanimity, nevertheless he is a knocker. Therefore in the words of the Latin phrase, 'Sic semper telephonus' or better still, 'Downus withus decremetus'. The ancient party's wave front is too full and his decrement is too high."

I paused for lack of breath and, the better to add an air of nonchalance to my argument, I adjusted my necktie and lit a havana. (O yes, I smoke havanas, they're made down in Connecticut somewhere). But I digress.

My friend then pushed a dandy one at me. Said he, "Hmm, must be some friend of yours that's doing that bum writing, or you'd never stick up for him. I never knew you to stick up for anyone before,



"A Bakelite monument should be erected to his memory."

anyhow!" Just like that. "I'm s'prised that Eddie don't go over that junk of The Young Squirt's with a fine toothed comb and then chuck it into the waste basket. Why, I'll bet that that guy is as old as Pharoah an' he was the guy who dug the moat around the Sphinx so that the critter wouldn't get its feet wet. Come on, own up. Who is this loud shouting, brainless son-of-a-gun? He can't be much good or he'd sign his name to that collection of rubbish that he hands us each month. I guess that Fred Kolster and Emil Simon ain't got much to fear from him. If he was funny that would be some excuse for him to publish his so-called epistles, but next to influenza, he's absolutely the rottenest thing that ever perambulated down the pike."

Needless to say, I was getting madder and madder every minute and by this time I was twice as angry as the proverbial wet hen. Perspiration was seeping from every

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poor pore in my body, my collar had wilted and my brain was in a whirl. My choice havana by this time was chewed into a mass on the end and I could be sent to State's prison for the thoughts that were running riot in my brain. So I turned to him, threw out my chest and retorted, "Why, y'poor fish, I dunno who's writing that stuff, all's I know is that I agree with him, like I always agreed with Teddy Roosevelt and Clarence Tuska, and them's two good men to foller. I ain't got nothin' against anyone in the world except the feller who invented work, grid leaks and measles. Now if you've got the idea in



"He turned purple around the gills and threw a book at my head."

that shallow bean of yours that I know this Young Squirt, you're nuts, that's all that I've got to say. I only know that I agree with him fully when he says that all things in amateur radio ain't rotten. Old Faded Whiskers would make a rotten lot of us indeed, and it seems that he has a worthy second in you. Them's my sentiments, take it or propel your nether extremities away over the long, long, trail."

That fixed friend ham. Zowie! He jumped up out of his chair, rushed over to me with the speed of a Pawtucket taxi-cab driver looking for a drink of Rock and Rye (gentle strains here from Chopin's funeral march), shook his fist under my nose and yelled in an outrageously high pitched voice, "I'm a rooter for the Old Man, and if you don't like it you can go to Heligoland. I'm gonna listen in on my set and see if I can hear 2XJ. Things have to be quiet to get him at all—I hope that I make myself plain!"

I jumped to my feet, let out a roar, and hollered just as loud as he did, "Well, darn your picture, your father's picture and every blankety blank phisog in your whole toe-kissing family. If duels were popular just now, I'd make it Colt automatics, if you wasn't so husky I'd knock all the electrons out of your hide—but as things stand, I'm gonna beat it. But before I go, take notice, yea, write it in big black letters—when I reach my domicile, I'm gonna put the family Bible on my key; I hope that you'll get 2XJ, but I have my doubts."

With this he turned purple around the gills and worked himself into such a rage he threw a book at my head. I deftly caught it—noted its title which was, "Wireless Course in Seventy Lessons". I shouted, "You're as out of date as this text you peruse", and retired in good form.

He yelled, "Bring back my book of knowledge or I'll have Hezekiah North after you!" Hezekiah is our town constable, he ain't afraid of me any an' I don't do any trembling when he approaches. So I beat it up the street.

I was madder than Josephus when the navy didn't take 'em over. I mean the amateur radio stations. Arriving home I proceeded to my wireless layout at a high rate of speed and turned the juice into my set, started my rotary, which ain't a Betsey, and placed a large volume upon the key. I then sat me down to peruse the Saturday Evening Post.

I let the old spark buzz for about a half hour and didn't even shunt my meter. I figured that revenge was so sweet it was worth what the old a.c. cost to get back at this fresh gazabo. Finally I felt the call of Morpheus and shut the old ether disturber off. You wait, that guy'll change his mind and I'll have him eating out of my hand before our next QST is out.

I've got to chop some wood for friend wife now, after which I'm gonna pull the kitchen clock to pieces as I want to get a gear for my new rotary, but before I close this edifying epistle, I want to remark that I hope we'll hear from old locoed Pete before long.

ANOTHER WASHINGTON'S BIRTHDAY RELAY

RELAYS on February 22d, it will be remembered are a kind of hobby with our friend Kirwan, Old Man 9XE. Old 9XE is planning such a relay for this coming Washington's Birthday, under the auspices of our A.R.R.L. Operating Dept., and wants to know what you fellows think of the idea. It will be a big popular relay in which many stations can take part, and will be a really novel affair, the present idea being to get a 20-word message from President-elect Harding addressed to all governors and mayors, and break it up,

(Concluded on page 14)

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A Contest for Practical Articles

A personal word by the Editor

FELLOWS, I have a new idea for improving our QST. QST is good—we all think it's the best amateur magazine in the world—but this is an idea that will make it still better. We want more practical articles for the amateur who wants to build a real spark station and doesn't know how. C.W. is a fine thing, and it will not be neglected in QST, as I sincerely believe the ultimate relay station will be operated with C.W., but at present 99% of our relay work is being handled by spark and it behooves us to give the spark station more consideration. We must remember that altho the men who already "know how" are more interested in articles on special and deeper subjects, the truly good spark stations of the country are only a very few dozen in number, as contrasted with many thousands of medio-re stations whose owners are looking diligently for the information that will enable them to bring their sets up to the A class. And it is more particularly to QST that they look for this kind of material, as it is our chosen field. I don't mean that we want to publish reams of matter of the "Junior Operator" class, for that is a thing better handled by text-books; we are faced with the more difficult problem of instructing the average A.R.R.L. member how to improve his already-existing station to the top-notch class. These stations are already as good as text-books can tell their owners how to make them, and the secret of the rest is a thing found, not in books, but only in the personal experiences of the men who have owned successful DX stations.

The thoughts of our older readers will go back immediately to QST's articles on "The Ideal Amateur Station", in 1917, and indeed it is articles of exactly that calibre, only brought up to date, which we now need. Our Publication Committee has got together and discussed how this material may be brought to light—how the successful men in our midst may be induced to overcome their modesty and tell how they do it for the benefit of the rest of us. We have decided to hold a contest and to invite every amateur to participate. This contest will not be to secure a description of the best amateur station in America, but to get the best practical information on how to build an ideal relay station. As receiving is so simple a thing that most of us already receive over much greater distances than we transmit, we will pay particular attention to the transmitting side, and we define the subject we want treated at THE IDEAL RELAY SPARK TRANSMITTER. For the best manuscripts submitted on this subject, under the conditions below, we will award

A First Prize of $50.00 cash
A Second Prize of 30.00 cash
A Third Prize of 20.00 cash

CONDITIONS

1. Manuscripts shall treat of the subject "The Ideal Relay Spark Transmitter" and shall cover, in whatever order the author prefers, the following sub-topics: Masts; Aerial and Lead-in; Ground; Change-over and Control; Selection of Proper Transformer; Condenser; Gap; Oscillation Transformer; Arrangement of the Transmitter; Wiring, Keys, and Line Protectors; Tuning the Transmitter; Receiving Tuner; Detector; Amplifier; Selection of proper Phones; Selection and Care of Storage Battery, if used; Practical Operation of the Receiving Set. As most of us have satisfactory receivers, the topics above relating to receiving equipment may, at the option of the author, be grouped as one topic and treated only briefly, without detracting from the value of the paper.

2. This contest is now declared open. All manuscripts shall be received in Hartford by Feb. 15, 1921, on which date it closes. Awards will be announced, and the First Prize Article published, in QST for April, 1921. Manuscripts shall be addressed to Publication Committee, QST Magazine, 721 Main St., Hartford, Conn.

3. The A.R.R.L. Publication Committee will act as judge of the contest. For the article deemed best, they will award the First Prize of $50; for next best article, the Second Prize of $30; for the next best article, the Third Prize of $20. No manuscripts will be returned. It is agreed that all manuscripts submitted become the property of QST and may, even if not awarded prizes, be used in part or entirely in QST, due credit being given the author. Honorable Mention shall be awarded any material so used.

4. All manuscripts shall be typewritten, double-spaced, on 8½" x 11" paper, on one side of the paper only. The author's name and address shall appear in the upper right-hand corner of the first sheet. There is no limit on the length of the article, but it should be no longer than necessary to cover the subject.

5. Manuscripts will be judged for their practical value in improving amateur operation. Authors should bear in mind that the idea is to aid less experienced men in perfecting their stations. The articles MUST be practical. Fantastic design to

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secure highly theoretical results will be heavily discounted, but the applied theory must be sound. Constructional details—the conveying to the reader of exactly what to do and how to do it—is what is wanted. Clearness of expression will count.

6. Manuscripts MUST be illustrated—the more so the better. Illustrations may be by rough sketches or good clear photographs, or both. Where the construction of a piece of apparatus is described, the sketches must be sufficiently comprehensive to unmistakably convey the idea.

At first we thought we would ask for articles on the best condenser, the best aerial, etc., but as one man's rotary gap would have no relation to another man's condenser, there would be no co-ordination. Indeed, the trouble in the average amateur station today is probably exactly that—the units are all right but they don't work together to form a harmonious whole. So to be of any value the articles must cover the station from power supply to antenna insulation. This is a "large order", but six weeks is plenty of time to fill it.

We cordially invite you and your friends to enter this contest. A contest of this nature by our QST ought to bring to light the best practical information in this country—which is absolutely what we want. Remember that this is a contest for the practical man—the pure theorist and the mathematical shark haven't a ghost of a show at it. If YOU own a good DX station, you have in your experience the stuff which will win these prizes, with a very small effort on your part. Help us to get this material for QST—describe the construction of the station which your experience in spark operation tells you will deliver the goods.

The Fading Tests

OUR readers will be interested in a preliminary report of the October fading tests which the A.R.R.L. carried out for the Bureau of Standards. It will be remembered that these were the second of four series of tests which, when completed, will give not only a collection of data on fading but will enable a comparison to be made on the conditions in summer, fall, winter and spring. As this is being written, recorders are being chosen for the third series, the Winter Series, which will take place during January, with the final series occurring in April. The tests will probably be made on the same nights as before, Tuesdays and Thursdays, and again we ask the co-operation of all amateurs in reducing QRM to a minimum during the transmission periods. We know we are asking quite a lot, and occasionally it will mean a little self-sacrifice, but we are doing a fine piece of work, fellow amateurs; we are adding to the prestige of the American amateur, we are attracting the notice of scientists the world over, and thru the excellent staff of the Bureau of Standards we are sharing in the world's first serious attempt to get at the explanation of fading signals. Do your part in this by causing no unnecessary QRM.

Preliminary reports from the Bureau show that, in general, the October tests were considerably more satisfactory than the summer tests, both because a larger number of records (about 2200) were secured and because, the recorders for the second tests being paired, the data are more reliable. Co-operation on the part of stations near recorders was a great aid, and in the First and Third Districts, especially, interference was reduced to the point where some recorders made practically perfect scores. The relaying of NAA's time signals by NSF's phone was inaugurated so that the transmitters might check their starting time, and this resulted in great improvement in this respect.

In the First District, very consistent recording was done by almost all of the officially appointed recorders. The Second District performed very indifferently, almost none of the recorders doing both good and consistent recording. The Third District was intermediate between the First and Second in performance. In the Fourth District few records were obtained because of strays and coastal station interference. The Eighth and Ninth Districts, as would be expected from their size, did not perform the same thruout; in general, stations in or north of Chicago performed well: those to the southwest of Chicago were hindered by strays, those to the southeast performed fairly well, while those to the east and northeast suffered from interference originating in Cleveland. Cleveland and Philadelphia have the distinction of having given the Bureau no reliable records, because of local amateur interference. It is rather surprising to note, also, that in general the special stations seemed to do much less careful and consistent recording than general amateur stations.

As to the performance of the transmitting stations: 1AW was consistently heard, as usual, coming thru regularly at points which reported hearing no other

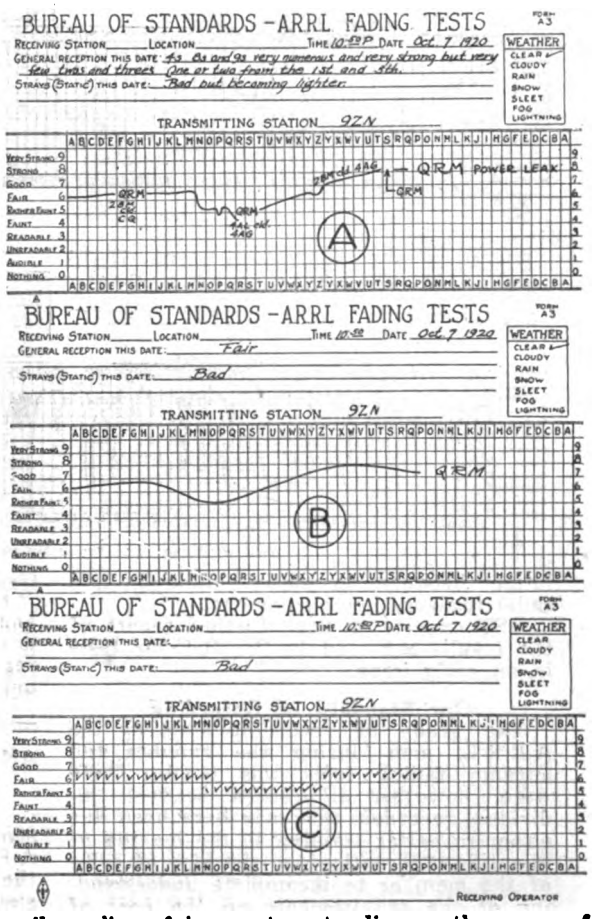
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First District station. NSF was tne most widely heard station, but chopper trouble experienced on several of the nights made some of the reports of questionable value. 8ZW was very consistent also. 8ER (now 8ZL) and 9ZN, particularly the former, were copied by practically all recorders on some evenings and by remarkably few stations on other evenings. 9ZN's signals appear to carry far better to the west, northwest, north, and northeast than to any point south of Chicago. Three schedules were missed; on one of these 8ZW substituted for NSF, whose power supply was cut off by fire at the Naval Air Station; on the last test 8ER had a station breakdown of some kind which would have caused the loss of the tests except for the quick action of 8ZW, who perceived the situation and transmitted the 8ER schedule on 375 meters, the use of longer wave resulting from lack of time to change back to 250 meters. As everyone was searching for 8ER, very few missed this test.

Special tests were sent from 8XK to determine if the erratic and abrupt swinging of that station's signals, as described by Mr. Kruse in December QST, were due to a characteristic of the set or of the location. These tests consisted of two parts, the first being sent on 8XK's usual set using the power tubes as oscillators as described in September QST. This test faded erratically as usual. The second part of the test, sent a few minutes later, was transmitted by the same tubes operating as amplifiers of a small oscillator. The erratic swinging then disappeared, leaving normal fading. Apparently when acting as oscillators the power tubes had been blocking or shifting frequency, this effect being superimposed on the true fading.

Two sets of daylight tests were also sent. One, at noonday, was a complete failure, no signals being received over 100 miles. The other, at sunset, has not yet yielded any information except confirmation of the fact that signals become stronger a few minutes after sunset.

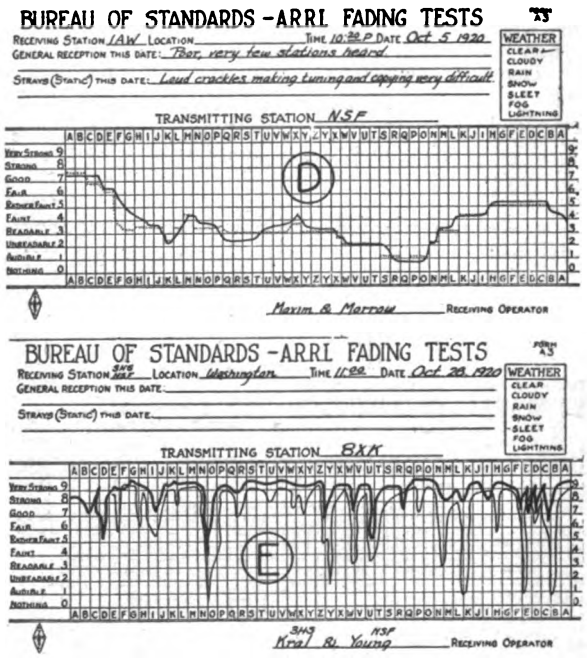
About a week after the start of the tests, short wave radio abruptly dropped out of existence in Virginia, as commented upon by Mr. Groves in November QST, and for three test nights no signals were heard, altho ship signals retained their usual intensity A week later the same phenomenon occured in the District of Columbia and not one of eleven recorders there was able to hear any signals outside the District with the signal exception of 2RK, Brooklyn (normal audibility 5000), who swung in very faintly just long enough for his sine to be recognized. The same conditions obtained in Baltimore, but at both points 450 meter ship traffic was very little less than usual intensity, while 952 meters seemed to suffer not at all. Still later during the tests the Ninth District experienced a similar blank. We seem now



in a fair way to get a line on the cause of this phenomenon, which has always been a thing that perplexed us amateurs. The Bureau learns from the Magnetic Laboratory of the Carnegie Institution of Washington that during the time when no signals were heard in the District of Columbia, the conductivity of the atmosphere was most abnormal; and that on the evening when signals returned, it changed quite abruptly from a very high value to a very low value without a corresponding change in atmospheric potential gradient.

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It is notable that during the evening in question, the "dead" condition in the District abruptly departed and within five miutes afterwards stations in the Ninth, Eighth, Fifth, Fourth, Second and First Districts had been copied. It is to be hoped that a careful examination of these data will develop an understandable relation between magnetic conditions and radio transmission phenomena.



QST expects to have further report of the results achieved in the October tests in an early issue.

Our Standard of Recording

The grade of recording done by the A.R.R.L. men during the summer and autumn fading tests was good. There were, however, differences between individual recorders that may have been due either to better training in the making of scientific observations on the part of some of the men, or to incomplete understanding of the requirements on the part of others.

Just what is required can be best explained by illustrations. The curves A, B, and C were taken in the same city at the same time, on an evening when slow fading made it quite likely that they were all hearing the same thing. Curve A is carefully drawn and useful auxiliary information is furnished regarding QRM. The weather check has been made, strays indicated, and complete "general reception" information furnished. This is the sort of curve that is valuable, and represents the best class of work done in the tests. Curve B is fair only, missing minor variations. The poverty of information furnished is, however, the main defect of this sheet. "Fair" indicates nothing as to the direction of best reception, neither does "bad" tell if the strays are increasing or decreasing. Curve C is valueless and indicates only that 9ZN was heard on the 7th. If there had been rapid swinging the system of using one check mark per group of five letters would have been totally inadequate. Finally, the weather has not been checked.

Remarkably good checks can be secured by two careful observers as is shown by the example of the two curves D, both drawn at the same station; and the curves E, drawn at different stations in the same city by two of our best recorders listening to a station 600 miles distant through bad short wave QRM. In the "D" curves the solid line is the curve made by one man and the dotted line that of the other. These curves were obtained on a "dead" evening through severe strays. The "E" curves are especially fine examples in that they show what can be done in the way of checking during rapid swings. Both of these curves were on reception with ground wires, the two stations being about 5 miles apart on the north and south line at right angles to the direction of transmission.

Recording is at the best a tedious job and it seems well worth while to put into it the small added effort that will produce really worth-while curves during the January tests.

ANOTHER WASHINGTON'S BIRTHDAY RELAY

(Concluded from page 10)

sending every second word but one thru A.R.R.L. stations from the west coast, and the other words, except one, from Atlantic stations, the two remaining words to be key words and started from opposite ends of the Central Division; and the whole traffic to be so routed that every station in the country will be able to get the complete message. C.W. stations will be given preference—probably the first time C.W. has had a prominent part in big relays.

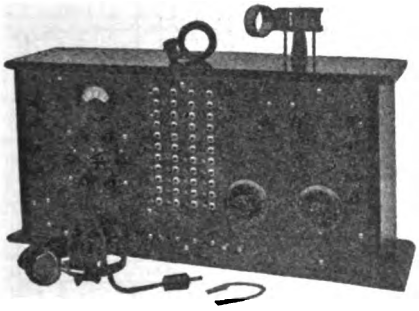
Interested parties especially C.W. men, are invited to communicate with Old 9XE at once so that definite plans can be formulated without further delay. His address is: W. H. Kirwan, Box 148, Davenport, Iowa.

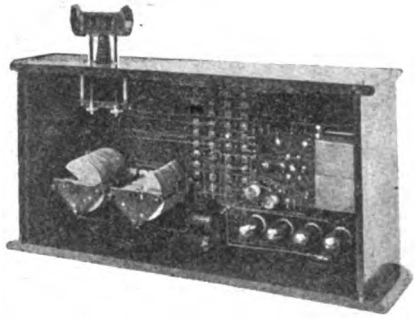
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Some Interesting Receiving Equipment

By John H. Miller

THE receiving set shown in the accompanying photographs was built primarily for experimental work, and is so arranged that the connections of the various inductances and condensers as well as the vacuum tubes are made on the front of the board with flexible leads and plug connecters. Being used with various sizes of honeycomb coils, a large wave length range is attained. The extreme convenience of the set is attained with some loss of efficiency, but using all four bulbs, and tuning properly, almost any station can be brought in loud enough to read if the static will allow it. Estimates of this loss of efficiency vary, but it is doubtful if it exceeds 15%.





The set is enclosed in a mahogany cabinet, with a removable back. The panel is made of black bakelite, ⅜" thick, grained on the front with sandpaper and oil. Everything except the B batteries, transformers, and coil mounting is mounted on the panel itself.

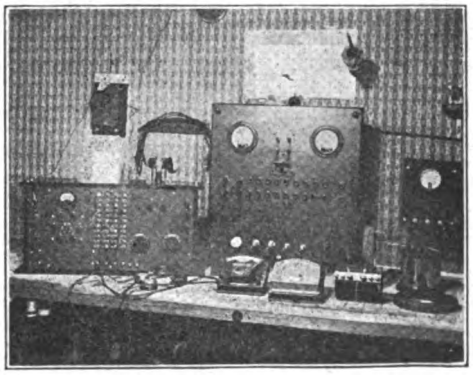
The coil mounting is of the conventional type, with standard plug connectors to take the mounted coils now on the market. The movable coils are actuated from the front of the panel by means of small knobs which work through bevel gears of a 3-to-1 ratio to the vertical shaft carrying the coil mountings.

The condensers are of conventional design, with a maximum capacity of about .0013 microfarads.

The vacuum tubes are held in a bank of four sockets made in one assembly. Their filament circuits include a shunt for measuring the current, and a variable resistance. A main switch opens the "A" battery circuit entirely so that resistance settings may be left as they are when shut down. The instrument shown is a millivolt-meter, and by means of the rotary switch in the center, it may be placed across the shunt in any one of the four filament circuits, reading the current; or the voltage of either the detector or amplifier "B" batteries may be read on other points of this rotary switch which places a calibrated resistance in series with the circuit. Thus one meter serves to read six different quantities, although it is usually left in the filament circuit of the detector bulb.

A high resistance is shunted across the "A" battery whenever the main switch is on, and a variable contact on this resistance connects to ground, which serves to give the grids of the bulbs a definite voltage relation to the filaments. This value can be varied by rotating the contact, although when the optimum point has once been found, further adjustment is rarely necessary.

The wiring diagram shows the general layout and the dotted lines show the connections to be made on the front of the panel for a coupled, parallel condenser circuit, suitable for long waves, with a detector and two amplifier bulbs in cascade. It will be noted that there are binding posts at each end of the panel for antenna, ground and battery, which is merely for added convenience.



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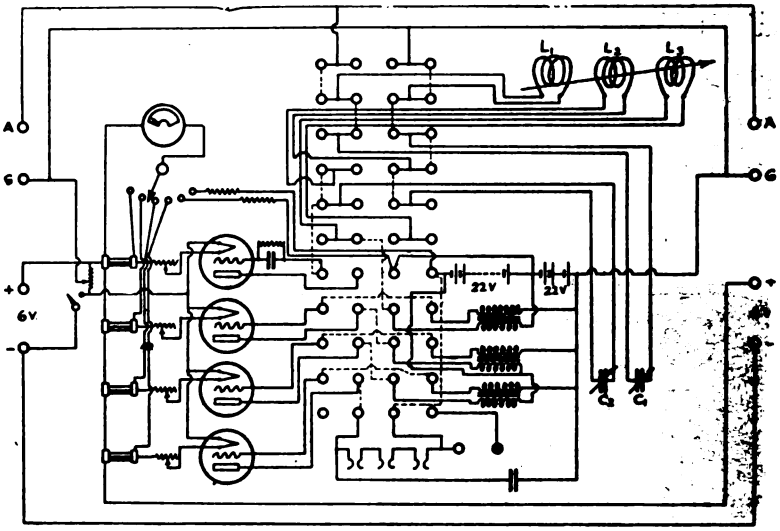
As an example of the general convenience of the set, we can use audiotron bulbs if we wish, measure the filament current, and plug in an external "B" battery with a variable potential switch for each bulb so used. Any part of the set may be replaced by another external piece of apparatus and the connections easily made by means of connectors with plugs on one end and clips on the other.

All the internal connections from the sockets and other terminals should be made with fairly heavy, say No. 16, bare capper wire, and all circuits that should be well insulated from ground may have varnished cambric sleeving slipped over the wire. To facilitate the tracing of internal circuits the wires should be run in straight lines with right angle bends.

So much for the receiving set.

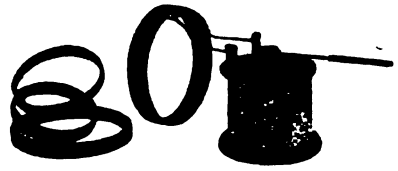
The wavemeter is merely a very carefully made variable condenser with several coils and suitable coil mountings. The condenser plates are mounted on heavy brass rods with large spacers, with end plates of hard rubber containing the brass bearings for the rotary plate assembly. The plates are of the logarithmic shape giving nearly a straight line wave length curve when plotted against the evenly divided condenser scale.

The coils are wound on micarta tube having a ⅛" wall. The shortest wave coil has been seven turns of "Litz", the next coil 30 turns of "Litz" in a single layer, the third coil has about 100 turns of No. 10 cottenamel in three layers, bank wound, and the last coil has 10 layers or 420 turns of No. 26 silkenamel. This gives four coils which with the condenser cover a wave length range of from 100 to around 18,000 meters. The coils have binding posts on their inner surface and the connections to the condenser are made with heavy bent rods equipped with spade terminals. The set was calibrated against a navy decremeter and checks well within one per cent when compared with other standards. When used to receive, a crystal detector connected unilaterally is used, and when used as a generator, a small buzzer and a single dry cell connected across the inductance serve to excite it sufficiently to check on the receiving set any incoming wave.



The photograph of the writer's laboratory shows the above apparatus, the alternating current board, the rectifying panel for charging the 6 volt storage battery, and some miscellaneous instruments, inductances, etc.

The alternating current board is simply a large plug board which serves to carry a transformer and an ammeter and volt-



meter. The transformer was described in Everyday Engineering of June, 1917, and has separate coils for 112, 28, 28, 14, 14, 7, 7, 7, and 7 volts. These coils are connected to the sockets on the face of the board and by plugging in the 112 volt line to the 112 volt coil, the other coils may be placed in series or parallel, and by further varying the primary coils an almost unlimited range of secondary voltage is available.

The rectifier uses tungar bulbs, and is connected by plug connectors to the other

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QRM and QRN Reduction

By Charles W. Eliason, Jr.

INTERFERENCES from neighboring stations or from ethereal disturbances are the great troubles of every wireless operator—amateur or professional.

Any system which can even partially obviate difficulties imposed by QRM and QRN certainly should interest the majority of "radio-bugs".

Most systems in use now-a-days depend for their action upon the "opposition of circuits", the effect being the reduction of static or other interference to a large extent, coupled with a relatively small loss of signal strength. This is all very well when one has amplifiers and amplifiers and amplifiers, but to the average operator, such a system means a very serious loss of received energy and receiving range. My plan is essentially the opposite of the type of elimination now used. The function of my scheme is to build up signal strength very greatly, at the same time increasing interference or static intensity very little. All very nice, you say, but how is it to be done? It might be interesting to know of some of the experiments made to this end.

One of the first successful circuits was a very simple affair. A lead from a short, low antenna was brought to one terminal of secondary tuning condenser, while the other terminal was grounded. See Fig. 1. (For the sake of simplicity only a crystal hook-up is shown). Very marked results were obtained with this arrangement; looser coupling was made possible and QRM thereby reduced; finally the effect of the low aerial was to increase the signal strength considerably and not to increase static materially if at all.

The next advance was made with the construction of a loop of peculiar qualities. It consisted of a single turn, triangular in shape, eighty feet on a side and **horizontal.** It had no directional properties. To this aerial system was added means of tuning —an inductance and a variable—the whole being shunted across the primary of the receiving transformer. (See Fig. 2.) The writer used honeycombs in a regenerative hook-up, and it was found that by placing L_1 in inductive relation to the "tickler", further amplification resulted.

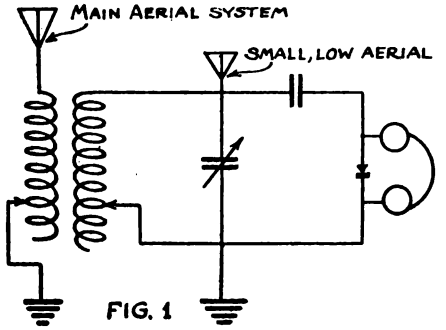


FIG. 1

I am particularly pleased with the foregoing circuit—it seems to possess the very qualities I was looking for. A great deal more energy is put into the receiving instruments; signals that were entirely inaudible on my set using an "aerial-ground" circuit come in by dozens—C.W. especially. At the same time QRN has the same or lesser intensity than with the ordinary hook-up. Looser coupling is possible because of the greater energy input and also because the coupling of the loop inductance to the "tickler".

The general features that I find valuable are low antennae systems, loops in con-

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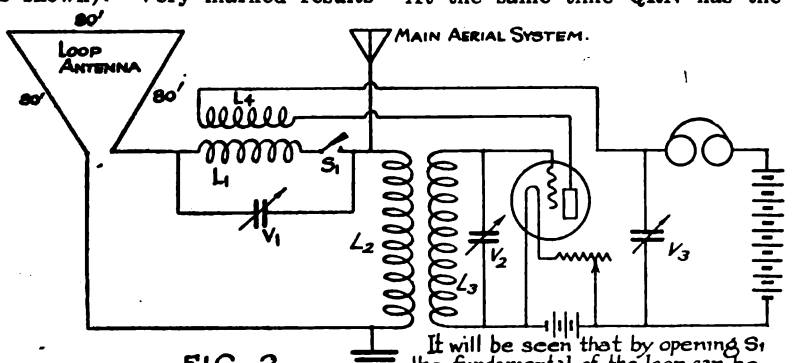


FIG. 2.

It will be seen that by opening S_1 the fundamental of the loop can be lowered by V_1, while by closing S_1 the fundamental can be raised by choice of inductance values and the capacity of V_1.

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"Station Reports"—A New QST Feature

THE A.R.R.L. is arranging to assist the Bureau of Markets of the Department of Agriculture in the dissemination of market reports via amateur radio, about which more will appear shortly in QST. The first work has already been arranged between the Department of Agriculture and the Bureau of Standards, and WWV, the Bustands station, is commencing the transmission of reports for the territory around Washington. As the work will probably be done in the early evening, it involves the selection of stations whose ability to hear each other is practically positive, and this brought to our Operating Department the problem of knowing always who such stations are. Our "Calls Heard" show where our signals are reaching, but that is no guide at all to working ability, as we all know; our trunk lines route via the reliable stations, but only in certain directions and do not show anything about working abilities in other directions around a particular station. An unofficial suggestion by Mr. S. Kruse, Associate Engineer of the Bureau of Standards, opens the way for the collection of the data: that we have certain of our good stations report every month who are the steadiest stations and who are the loudest stations from each district heard at their own station. This is an excellent idea and has been adopted by our Operating Department. To inaugurate it, all officials in the Operating Department personnel are being asked to send in such reports with their regular monthly reports. Thus they will be collected here at Headquarters and will be a monthly guide to the Traffic Manager in the selection of stations for any important work. But of more especial value to most of us will be their publication in QST—which will show not merely who is heard, but who is heard loudest and most consistently. This will help all of us to improve our stations.

Mr. Kruse has started the ball rolling with a report from Washington. This information was compiled by him from reports of reception by members of the Washington Radio Club at nine different stations. Mr. Kruse, it will be remembered, has been in charge of the fading tests at the Bureau of Standards, which adds much weight to this report upon our signals, and gives us definite information as to which of our stations are the best performers when one is receiving at Washington. We are asking Mr. Kruse to favor us with such a report every month —which should be a constant guide and inspiration to all of us to IMPROVE.

The report of stations as received at Washington follows:

First District: No consistent station. Best ones 1AW, 1HAA; latter about 50% as reliable.

Second District: 2RK at least ten times as good as next competitor and never fades clear out. Only one other station outside of Washington received as well.

Third District: Hard to choose. No consistent performer at all. Toss-up between 3BZ, 3GO and 3VV. None of the specials are worth much. Old 3NB was fine, but not heard lately.

Fourth District: Fine and steady some evenings—nil at all on others. When the district as a whole is in, it is a choice between 4DM, 4YB and 4AL.

Fifth District: No consistent performer. 5XA best (if he would talk instead of always CQ-ing). 5ZP, 5ZL and 5DA all good.

Sixth District: (Think we heard 6EA once.)

Seventh District: Nil.

Eighth District: 8ZL never fades clear out. 8XK second best (a very good second at that). All others fade out at times and some evenings can not be worked. 8ZW very good here but is no further off than 1AW. The Eighth District is the best we get (except 2RK and 9ZJ) but in the light of commercial standards it must be confessed that even they are not always "there". Among the best are 8ZY, 8HH, 8ACF, 8DV. At the time when old 8DA was going he completely eclipsed all others but he seems to have dropped off the earth.

Ninth District: 9ZJ has it all over all others out of town—2RK included. Among the best are 9CP, 9ZN, 9AU, 9LR 9LQ, 9OJ, 9AKC, 9AEQ, 9AJI. Of these the loudest are at times 9LR and 9ZN but the most consistent are 9AU and 9CP.

SOME INTERESTING RECEIVING EQUIPMENT

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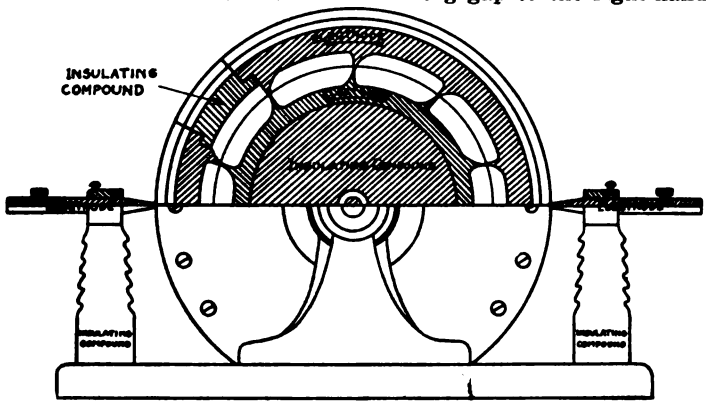
board for the AC source, thus eliminating the need for another transformer. The meter on its face measures current on charge or dicharge as well as voltage by means of a rotary switch which connects in shunts or series resistance.

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A Rotary Gap of High Quenching Characteristics

THRU the courtesy of Mr. Ernest Oke, of Peterboro, Ont., we present drawings of a rotary gap, designed by him, which should possess excellent quenching ability. Its construction is beyond the average amateur, but those with mechanical engineering experience and facilities will doubtless be interested in its possibilities.

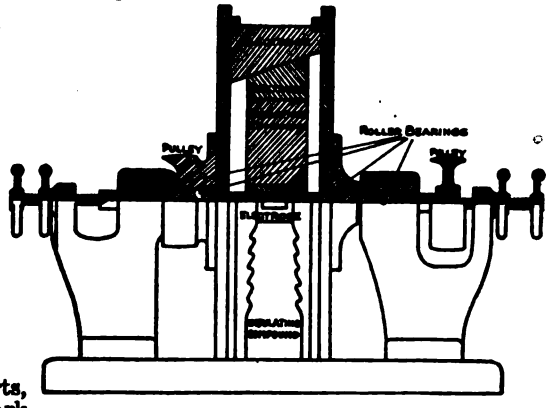
As the drawings show, the principal idea of the gap is the two concentric members bearing two sets of ten electrodes, the inner member revolving clockwise at a speed of 3000 RPM and the outer member counter-clockwise at the same speed, giving an effective speed of electrode movement equal to 6000 RPM and providing a spark note of 500 cycles. The designer has employed sveral approved methods of securing superior quenching: four gaps in series, gaps in parallel, and a time constant at the peripheral speed attained calculated to limit the time of sparking to four complete oscillations in the closed circuit on 200 meters.



The inner revolving member consists of a conducting rim bearing ten teeth, supported on an insulating disc. This disc is fastened to the main shaft, which is driven by the right-hand pulley shown in the side view. The outer revolving member consists of the metal rim of a kind of revolving case, the sides of which are formed of insulating material, and the inside of the metal rim bears ten electrodes similar in shape and spacing to those on the inner member. The outer member, however, is divided into two equal sections of five teeth by inserted segments of insulating material. One such segment is shown in the upper left quarter of the left-hand drawing, and the other segment is diametrically opposite (altho not shown). The driving pulley of the outer member is directly conntected thru a flange to the insulating material which forms one side thereof. Two stationary electrodes, disposed on either side of the revolving parts, are also provided. These electrodes spark directly to the smooth outer edge of the outer revolving member, but are adjusted as close as possible.

The spark path, then, is from the left-hand stationary electrode to the lower section of the outer revolving member, thence across the five teeth thereof (in parallel) to the five opposing teeth of the inner member, thence thru the five other teeth of this inner member (in parallel) to the five opposing teeth of the upper section of the outer member, and thence across the remaining gap to the right-hand stationary electrode.

The electrodes are in the form of knife edges and of ample width to provide the necessary sparking surface. The edges of the revolving electrodes are not parallel with the shaft, which permits adjustment of the length of gap by adjusting the set screws and lock nuts at the ends of the shaft which bears the inner member. This adjustment may be made while the gap is in operation



Roller bearings are used thruout. It will be noted that the outer member revolves counter-clockwise over the very

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Experiments With Single Layer Coils

By A. L. Groves

HAVING stated previously that the Honeycomb and Duo-Lateral coils were rather inefficient on the short waves and suggested a method of winding and mounting single layered coils for these waves in August QST, the question naturally arises as to why the honeycombs and other windings of this character should show to a greater advantage on one range of waves than they do on another.

With this in mind I set about to experiment further with the "unit type" of single layer coils, and while the statements I make in this article must not be taken as conclusive, I will give to you fellow amateurs what data I have collected in my experiments so far and hope it may lead to discussions that will give us all a better and broader view of the receiving end of radio.

After completing the short wave coils as described in November QST, I wound a bakelite tube, 5¾" outside diameter and 9 inches long, full of No. 32 enameled wire for a secondary coil for long waves. This was approximately 990 turns of wire. At the same time I wound several other coils with No. 28 enameled wire for the primary circuit, and incidentally the plate coils. After testing out this secondary coil it was found to be almost exactly equal in inductive value to the DL and HC coils No. 1000, and with a 23 plate condenser in

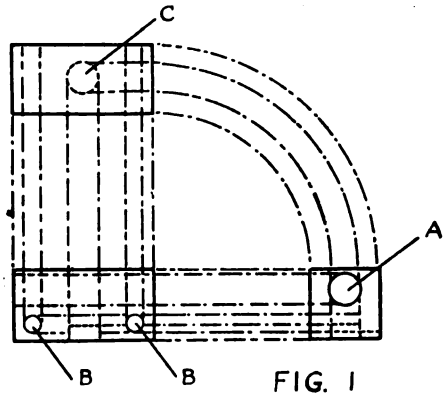


FIG. 1

shunt it responded over a range of waves from a little less than 4,000 meters up to about 11,500 meters. The first noticeable peculiarity of this coil was that signal strength did not appear to be the least decreased by the use of a large amount of the condenser. That is, signals on the longer waves tuned in with as much ease and clearness as they did on the shorter waves, KIE and OUI being received with equally the ease of BZR, BZL, NAW, NAU, etc.

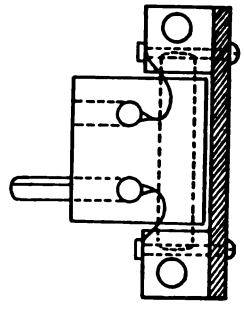


FIG. 2

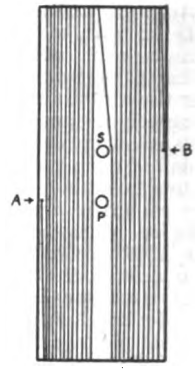


FIG. 4.

My next trial was with a secondary coil 5¾" outside diameter and 4½" long, wound full of No. 32 enameled wire, which was about 495 turns. This coil represented the same inductive value as the DL-600 coil, which is slightly more than the corresponding HC-600 coil. It was found to respond over a wave length range of about 2,000 to 6,800 meters with the 23 plate condenser in shunt and, like the other coil, the effect of condenser capacity did not seem to hurt it in the least and KET, FL, NAR, etc., on 6,500 to 6,800 meters, were received with equally the ease and clearness of the stations around 2,000 to 3,000 meters, represented by WNU, US, PWA, MPD, WDR, etc. I also made direct tests on the waves to which both of these coils would respond, and the results on about 4,000 to 6,800 meters (including BYB, XDA, VAL, BZL, NAW, NAU, NAT, NAR, FL, KET and many others) further strengthened the first impression that the coils were not appreciably affected by condenser capacity.

Without going into details regarding my further experiments will say that the 75 turn coil previously described in November QST approximately represents HC or DL-150. A coil 1¼" long wound with 110 turns represents coils 200; 1¾" long, wound with 165 turns, represents coils 250; 2" long, wound with about 192 turns, represents coils 300; 2¾" long, wound with about 247 turns, represents coils 400; 3¾" long, wound with about 385 turns, represents coils 500; 4¾" long, wound with about 495 turns, represents

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coils 600; 6¾" long, wound with about 715 turns, represents coils 750; and 9¼", wound with about 990 turns, represents coils 1000.

All coils are 5¾" diameter and wound with No. 32 enameled wire. The extra ¼" length which these figures allow will be explained later.

It is well to note that my experiments did not seem to warrant the use of larger size wire than No. 32. While larger wire would undoubtedly be somewhat better it necessitates longer cylinders and a given number of turns with large size wire does not represent as much inductive value as the same number of turns with smaller wire, so after many experiments I finally decided No. 32 was best suited for all-around use. As an example of the inductive values of different size wires, with a coil of 315 turns of No. 28 enameled wire, NAH on his 1500 meter press wave tuned in with the condenser at 17 degrees; WNU on about 2,500 meters tuned in at 63 degrees. With the same size coil wound with 200 turns of No. 32 wire, NAH tuned in with condenser at 20 degrees and WNU with condenser at 68 degrees, so it is seen that the 315 turn coil was only a shade larger in inductive value than the 200 turn coil with the smaller wire.

From my experiences with these coils side by side with both the Honeycomb and Duo-Lateral and the known inefficiency of the H.C. and D.L. on the short waves, and of the old style loose couplers in general, I have formed the opinion that it is not so much the form of winding of any of the new concentrated coils that make them appear so efficient but that most of their efficiency is due to their "unit" form, which frees them from the losses sustained by taps, switches, dead-ends, loaders, etc., which were so common to us all in the old pre-war apparatus. The dead-end losses are very marked if one makes careful experiments with tapped and untapped coils, but it is not nearly as deadly as the adding of loaders in the primary, and "grid coils" in the secondary, etc. Every loader added subtracts greatly from the efficiency of the set as it takes part of the energy already received to excite each additional coil and the coupling effect between primary and secondary is displaced to such an extent that it is impossible to obtain correct transfer of energy.

It is apparent that the regular mounting cannot be used with the longer coils and I herewith present a plan for a mounting that is well suited for any length coil and also for the regular D.L. and H.C. coils as well. In Fig. 1 we have a piece of brass 1½" square and 1" long, drilled lengthwise with a ¼" hole as at A. Turning the piece of brass sidewise, drill two $\frac{3}{16}$" holes as at B,B. Then on the under side drill another ¼" hole about ⅛" deep, as at C. Four such pieces are needed for the completed mounting.

The brass rods that act as a hinge are then taken out of two of the regular DeForest mounting plugs, and ¼" bakelite rod is substituted in their places. Two of the brass pieces first described are now selected and one of the mounting plugs is placed between them with the projections of the ¼" bakelite rod in each of the ¼" holes shown at C, Fig. 1. These are secured in this position by a strip of bakelite and No. 6 brass machine bolts passing through the holes B in Fig. 1. The complete assembly is shown in Fig. 2. Two of these assemblies are necessary, one for the primary and the other for the plate, and each is mounted on ¼" brass rods of any length desired, 8 to 10 inches long being about right for the average experimeter. The complete mounting is shown in Fig. 3. A Sears-Roebuck 6A9166 is used for the center or secondary coil plug and should be raised with a bakelite block until it presents an even front with the primary and plate plugs.

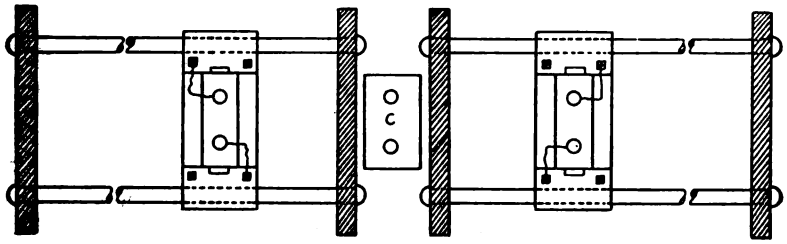


FIG. 3

In my first experiments the coils were mounted in the regular DeForest manner with DeForest plugs and a bakelite band, but as it was impossible to purchase the regular DeForest plugs, it was decided to rearrange the coils so the Sears-Roebuck 6A9166 plugs could be used. This method requires a ¼" longer cylinder, but makes a stronger and all-around better coil, as well as being cheaper and easier to make and mount. To make a coil of this kind, the desired length cylinder is secured and, referring to Fig. 4, drill two $\frac{3}{16}$" holes in the exact center of the coil as at "S" and "P". These holes are spaced exactly $\frac{5}{8}$" apart. A winding machine is made of a

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piece of 5½" plank to which has been attached a handle and bearings. The cylinder is then slipped over this board and keyed in a firm and true position by means of little wedges inserted at each end of the cylinder. Secure the wire on the left hand end of the cylinder as at "A", leaving enough loose end for connection to "P" when finished. Give the coil a coat of shellac and wind in the direction indicated, which, when viewed from either end after completion, will be in a clockwise direction. Wind up to within a turn or two of the holes S and P and then skip to an equal distance on the other side of them as indicated. Finish winding to the end and secure wire at "B", leaving enough free end to be connected to "S". Attach the plug and the coil is complete. The "plug" of the plug is placed in position over the hole "P" and the socket of the plug over the hole "S" and screwed up firmly by the bolts that accompany the plug, the end of wire at "A" being connected to the screw in hole "P", and the end at "B" to the screw in hole "S". This is important, and if the coils are wound and connected as indicated they can be interchanged with the Honeycombs and Duo-Laterals at will. That is, you can use one of these coils in the primary, a H C. in the secondary and a D.L. in the plate, or mix them up in any manner desired. If connections or winding are reversed this cannot be done. The writer completed the 9¼" coil in 30 minutes and the 4¾" coil in 15 minutes and smaller ones in much less time, so the task of building them is not great.

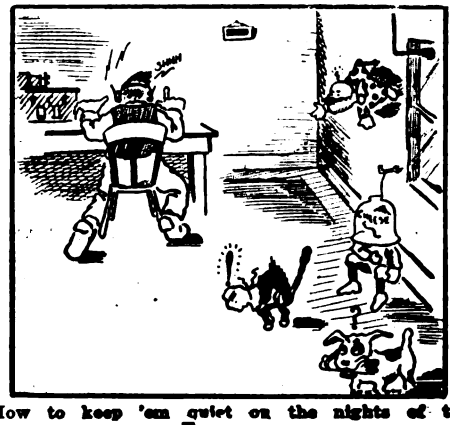
If there is no objection to the space occupied by them I certainly believe these coils worthy of a trial, especially if one does not care to invest in the high prices of the Honeycombs and Duo-Laterals. Attention is also called to the fact that the

(Concluded on page 24)

January Transcontinental Test Messages

By F. H. Schnell, Traffic Manager

THE sporting blood of the Operating Department personnel has been aroused over the forthcoming transcontinental tests, and a keen rivalry among the various divisions in preparing for the tests shows that they are a thing we have been waiting for. The enthusiasm is the kind that produces results, and so we are assured of some real races against time in middle January.



How to keep 'em quiet on the nights of the Transcons.

Routes

The following station routes have been selected for the transmission of the Transcontinental Test Messages on January 14th, 15th, 16th, 17th, and 18th, 1921. Changes will be made where necessary between now and those dates if better plans develop.

TRANSCON No. 1 Jan. 15, 16, 17, 1921.
1:00 A.M. E. S. T.

Scheduled	Alter. #1	Alter. #2
1UQ		
1CK or 1DY	1CK or 1DY	1CK or 1DY
1HAA	1HAA	1HAA
1BBL	1AW	1AW or 1BBL
2RK	3HJ	2RK
	8DV	2JZ
		3DH
		3HJ
		8DV
8ZW		
8ZL		
9ZN		
9JN		9ZL
9HT		9ZC
9ACF or 9UP		9WU
6ZH or 6JT		7IM
6BZ or 6BQ		7CC or 7FT
7ZB or 7BP or 7DA or 7ZJ		

Note: At 9ZN this message must go via two routes as shown. This is to test the northern trunk line with the central. Time of arrival in Portland, Ore., is very important, as noted over the two routes.

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TRANSCON No. 2, Jan. 15, 16, 17, 1921. 1:00 A.M. E. S. T.

Scheduled	Alter. #1	Alter. #2
1AW	1AW	1AW
2RK	2RK or 2JU	2ZL or 2RK
8ZW	3DH	3DH
3AEV or 3BZ	3XF or 3KM	8ZW
4AG or 5DA	3AEV or 3BZ	3AEV or 3BZ
5XA or 5ZP	5DA or 4AG or 4YB	5DA or 4AG
5YH or 5ZL	5ZP or 5YH	5YH or 5ZP
5ZC or 5ZG	5ZC or 5ZG	5ZC or 5AJ
5ZA	5ZA	5EJ
6KP or 6JD	6ZH or 6JT	5ZA
	6BZ or 6BQ	6ZH or 6JT
	6ZK	6BZ or 6BQ
	6KP or 6JD	6ZK
		6KP or 6JD or 6JM

TRANSCON No. 3, Jan. 14, 15, 16, 1921. 10:00 P.M. Pacific Std. Time.

Scheduled		*Alter. between 8ZL and 1AW
6ZE		8ZL
6BZ or 6BQ		8ZW or 8ZD
6ZH or 6JT		8DV or 8RQ
9ACF or 9UP		3HJ or 3DH
9LR	9HT	2JZ or 2ZL
9KV or 9LC	9JN	2RK
9ZJ	9ZN	1AW
8ZY	*8ZL	
8ZW	8ZD	
2RK		
1AW		
1HAA		
1CK or 1DY		

Note: At 9ACF or 9UP this message must go via two routes as noted.

TRANSCON No. 4, Jan. 14, 15, 16, 1921. 11:00 P.M. Central Std. Time.

Scheduled	Alternate
9WU	9EE
9ZT	9HM
9JN	9AEQ
9KV	9LC
5ZL	5YH or 5ZC
5ZP	5ZP

SPECIAL TRANSCON No. 5, Jan. 18, 1921. 2:00 A.M. E. S. T.

1AW
9ZN or 9AU
5ZL or 5YH
*5ZC
5ZA
6ZA
6ZK

*5ZC will QRX for the stations on either side of him in case of emergency. We want to make this in the longest possible jumps reliably. If 5ZA can copy direct from 1AW, he should pass it on at once, being sure it is received correctly, and the same for other stations on this route. Speed is what we want on the message and the reply.

This will be a personal message from Mr. Hiram Percy Maxim, President of our League, to Mr. A. E. Bessey, Manager of the Pacific Division. Mr. Bessey will be on the job to make his reply immediately upon receipt of Mr. Maxim's message.

In order to cut down the time necessary for transmission, the number of stations participating has been reduced to a minimum. Accordingly, many good stations have not been included. This is unavoidable and we hope that those not included will not feel that they have been neglected but will realize that the question of location had to be considered. Stations not included can co-operate by doing all in their power to keep the air quiet on those nights, and by clearing the paths as far as possible so that we may carry out our undertaking most successfully.

Terminals

Transcon No. 1.—From Portland, Maine to Portland Oregon.
Transcon No. 2.—Hartford Conn. to Los Angeles, Cal.
Transcon No. 3.—San Francisco, Cal. to Boston, Mass.
Transcon No. 4.—Ellendale, N. D. to New Orleans, La.
Transcon No. 5.—Hartford, Conn. to Sunnyvale, Calif.

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Starting Times.

Transcon No. 1 starts at Portland, Maine, Jan. 15-16-17 at 1:00 A.M. East. Std. Time.

Transcon No. 2 starts at Hartford, Conn., Jan. 15-16-17 at 1:00 A.M. East. Std. Time.

Transcon No. 3 starts at San Francisco, Jan. 14-15-16 at 10:00 P.M. Pac. Std. Time.

Transcon No. 4 starts at Ellendale, N. D., Jan. 14-15-16 at 11:00 P.M. Cent. Std. Time.

Transcon No. 5 starts at Hartford, Conn., Jan. 18th only, 2:00 A.M. East. Std. Time.

Because of the difference in time between the East Coast and West Coast, Transcons Nos. 1 and 2 will be starting from Portland and Hartford, respectively, on the 15th, while it is still one day earlier on the Pacific Coast.

Prefixes and Replies

In order to avoid confusion concerning the route to be followed for each message a special prefix has been adopted. On the night of the 14th, Transcon No. 3 will start from San Francisco at 10:00 P.M. bearing the following prefix: "Transcon 14 msg No. 3" etc. On the other nights the prefixes will be the same except for the change in dates ("Transcon 15 Msg No. 3" etc.). Replies also shall bear a special prefix in order that they will reach the proper destination. The speediest possible route shall be used for the replies and in the longest reliable jumps. Reply to Transcon 14 Msg No. 3 shall be in this form: "Transcon 14 Reply No. 3", etc.

Alternates

The stations taking active part in these tests shall make every effort to copy all or any part of each message and each reply, no matter from which station, and in case it does not reach their station after a reasonable period of time, via the route laid out, shall pass it on to the next station in line. However, each message and reply must be acknowledged in every case. Keep strict record of the time on every station you hear. We must try to follow the route as closely as possible, but weather conditions may interfere and necessitate calling alternate stations into action. Operators must exercise great care in calling alternate stations so as not to cause confusion among the others. Stations acting as alternates will remain silent unless they are called upon to assist in getting the messages through to the proper stations for further relaying. Stay on the job and QRX, as you never can tell what unforeseen interference may arise.

All Stations

In addition to the stations handling the tests, ALL AMATEURS are invited to copy everything they hear concerning these messages and forward their complete data to this office, which will be used in compiling the story for QST. This information should include call letters of transmitting stations, time, and date.

The entire success will depend upon the co-operation in absolutely eliminating QRM, and to that end we ask you to keep your transmitters silent and your receivers in action on those nights. We want the entire assistance of our League in this respect and to have the members ask their friends to co-operate to that extent. We can make these tests the most interesting thing that ever happened in Amateur Radio.

EXPERIMENTS WITH SINGLE-LAYER COILS

(Concluded from page 22)

mounting need not be arranged to swing if not desired and the S-R plugs can be used throughout, making them stationary on primary and plate mounting, and using the sliding feature for coupling purposes entirely.

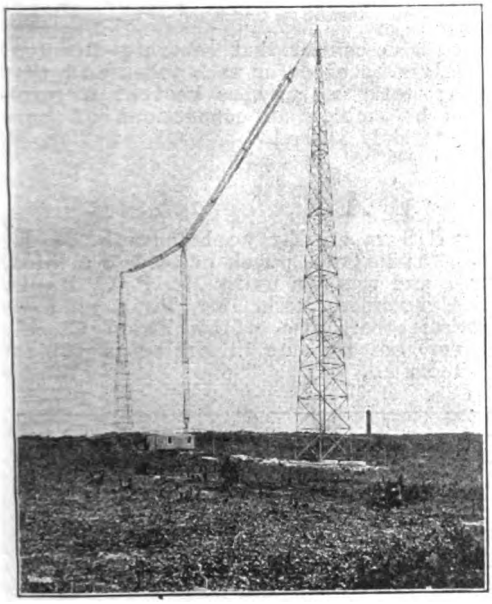
I would also suggest the use of banked windings on coils for the extremely long waves as it hardly seems advisable to use coils longer than 10 or 12 inches, nor would it be advisable to use wire much smaller than No. 32. In all, with a mounting as described arranged to take care of different length coils, many interesting and valuable experiments with different coils may be carried on, but as far as it is reasonably practical to go with the single layered coils in the unit form I believe they will give just as good an account of themselves as almost any of the others. Indeed I do not believe I am rating them too high when I say that for waves up to about 5,000 meters they are really better than the H.C. or D.L. and I have obtained audibilities from FL, OUI, KIE and KET with them that have not been duplicated with anything else. As far as my experiments have gone and considering all points, there appears to be a difference in favor of the single layered winding up to 10,000 meters, anyway. I have heard any and all signals on these coils that I have heard on the D.L. or H.C., notwithstanding the fact that they are wound with a smaller size wire.

Therefore, notwithstanding the theories against enameled wire, distributed capacity and resistance, the single-layered coil appears to hold its own surprisingly well in direct comparison under actual working conditions against actual signal strength and distance, and indicates that perhaps the greatest improvements in the winding of radio inductances has been the making of "unit" coils, rather than any actual "form" of winding and criss-crossing the turns.

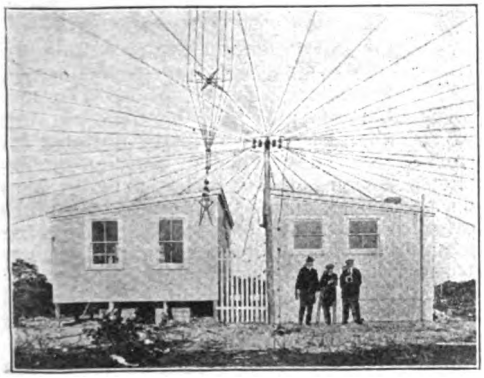
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Antenna Ideas Here

THESE two photographs are of the new coastal station of Cutting & Washington, located at Easthampton, Long Island, call letters WSA. They contain a number of ideas of interest to amateur constructors. The aerial is a six-wire cage in a T-shape, the vertical portion likewise being a cage. The



close-up shows one of the former at the bottom of the vertical portion. The towers are of galvanized steel, total height 175 feet, 300 feet apart. A radial counter-



poise is used, consisting of 36 wires in six sets of 6 each, supported at the station by the short 20-foot pole shown in the close-up and radiating to similar poles shown in the background of the general view, practically covering six acres. Note the insulation of the counterpoise wires. The far ends are similarly insulated.

Easthampton is about a hundred miles from New York, and the station should therefore be fortunately situated for handling New York traffic with shipping and avoiding the harbor QRM. Direct telephone and telegraph wires connect it with the city. The apparatus is Cutting & Washington.

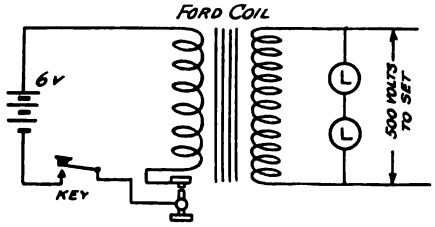
Incidentally, the center figure in the group alongside the station is Mr. E. A. Gisburne, their Superintendent of Traffic, formerly A.R.R.L. City Manager of Boston.

Cheap I. C. W. Potential

THE following scheme may solve some of the difficulties encountered in obtaining high potentials for I.C.W. Any amateur can make it simply and easily. The apparatus needed is:

1 Ford coil
2 250-volt 16 c.p. lamps
2 lamp sockets
1 6-volt battery

The connections are indicated in the diagram. A spark coil gives a very high voltage but the lamps act as an enormous load and bring down the voltage across



the leads to the set to the value of the drop across the lamp bank, in this case 500 volts. The tone emitted is the tone of the vibrator and no further modulation is necessary. Perfect modulation is obtained because when the cycle is at its positive half the bulb oscillates, and when at its negative half the bulb stops oscillating entirely and no energy is radiated.

The connections for such a set are simple and well-known. The device as described may be used for telegraphy in conjunction with the simple radiophone which I described recently in QST.

—F. S. Huddy, 1II.

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Tuning the Colpitts Circuit

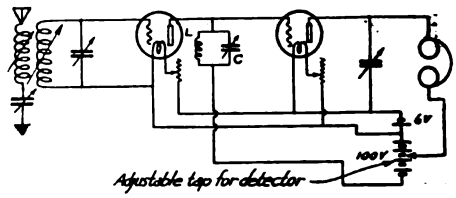
THE adjustments on a set using the Colpitts circuit are so inter-related that its tuning is generally rather difficult, and a few words on that subject may be of value. As commonly used by amateurs there are four adjustments necessary: the aerial tap on the inductance, the plate tap on the inductance, the variable condenser in the ground lead, and the variable grid condenser.

The aerial tap controls the wave length, subject to changes in the capacity of the series condenser and also being influenced to a smaller degree by the location of the plate tap. With the ground condenser set about mid-value, the aerial tap should be adjusted approximately to the wave length desired and the series condenser adjusted for maximum antenna current. The coupling tap is then to be adjusted, and in general as the proper position of this tap is approached the antenna current will increase as the plate current decreases, so that as a rule its position is that which gives the lowest plate current. This is because when not oscillating this set draws more current than when oscillating. In telephone work there is still another important adjustment—the grid condenser. This should always be a variable, for if its capacity is too large the drop across it is not as large as permissible and the possibilities of the set are not realized; while if too low, the potentials impressed on the grid will be sufficient to swing it thru its entire range of values and badly distort the speech. It should be possible to determine its correct adjustment by noting a flicker of the antenna meter when speaking in the microphone, particularly on the word "Hello!".

Because each of these adjustments have an effect on all the others, the operator should go over them two or three times until finally they are got down to their proper values.

Radio-Frequency Amplification with A-P Tubes

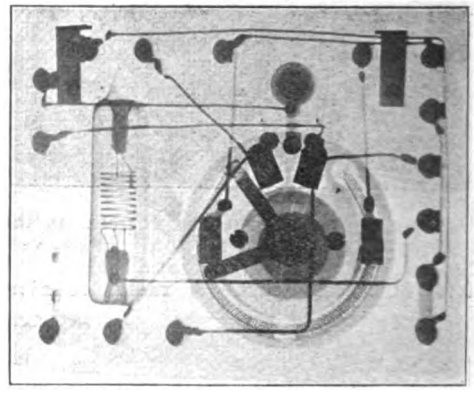
THE Moorhead A-P Amplifier has a comparatively low internal capacity, amounting to 3.3 millimfds. between grid and filament, and 4.2 between plate and filament, as compared with 7.1 and 9.2 millimfds., respectively, for the VT-1. The University of California has carried out some tests which show that with care excellent results in 200-meter r.f. amplification may be had with this tube, using the circuit shown, wherein the first tube is an A-P amplifier, the second tube a gaseous detector, inductance L an L-25 honeycomb or 24 turns of wire on a 3" tube, and condenser C a variable of 0.0005 mfds. maximum. This is an impedance-coupled amplifier, the circuit LC being tuned to the resonant frequency, at which point it offers infinite impedance.



It is essential that separate filament rheostats be used for each tube, and that electrostatic capacity be kept at a minimum by making all connections of bare wire, widely spaced.

A Radiograph

THIS is an X-ray photograph of an AudioTron panel of ¼" Formica, and was sen us by Mr. P. C. Rauls, of Menominee, Mich. Mr. Rauls sent us several others also, of his Eaton Circuit Driver, but the one illustrated is typical of them all.



English magazines have been using such radiographs in their descriptive articles for some time. They serve to convey an excellent idea of the interior arrangement of a piece of apparatus, in some cases much better than can be done by either drawing or photograph. And they certainly show up anything in the way of inferior workmanship! Screws driven in cattawampus, bungled soldering, or untidy wiring, will stand out like the nose on your face.

What the Editor is c. to k. about the view reproduced here is how the effect of "high lights" was produced and why certain parts of the wiring, apparently at the same distance as the balance, were barely visible.

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Tuning the Transmitter

By James L. Autry, Jr., 5ZX

DURING our past season there was a great deal of trouble in connection with the QRM which made it impossible to get many messages thru in a hurry. To a great extent this was blamed on the fellows with spark-coils and the ones with transformers who never pretend to tune their sets at all. This was true in a great measure, but the long-distance fellows themselves caused a great deal of trouble in this way by not taking the trouble to tune their sets carefully, and leaving the set as it was when the hot-wire ammeter showed the greatest flow of current. This is a good rough way to tune, but the meter registers all the current that is put out at any and all wavelengths; while the energy at one definite wavelength is all that will be absorbed by the receiving station.

To be sure that you are putting out the maximum amount of current at one sharp wave and at no other requires more than to tune to resonance with a hot-wire ammeter. It is the purpose of this article to briefly describe a method which requires only a wave-meter, such as any amateur possesses, in connection with a hot-wire ammeter.

The first thing to do in tuning a transmitter is to get exactly the correct amount of capacity to obtain the greatest amount of radiated current and a clear spark. A condenser with single plate adjustment is very useful for this purpose, as very nearly the right capacity can be obtained easily. In this connection the ammeter can be used advantageously, merely changing the capacity and tuning to resonance again, until the greatest radiation is obtained. (Of course the closed circuit should be tuned to the open, on changing the capacity in the former, and not vice-versa.) The next question is the condition of the emitted wave, its sharpness and purity: which is really the object of this article. By means of the wavemeter tune the closed circuit to exactly the wavelength you wish to work on, taking care not to make it so small that under three or four turns will be used in the open circuit as this will broaden the wave somewhat. Then put the inductance of the wavemeter in inductive relation to the ground lead, taking care to place it so it is not in the field of the primary of the oscillation transformer —this can be determined by removing the secondary clips and turning the wave-meter so that the light does not glow. If the particular meter which is in use is not equipped with a lamp, put a three volt lamp in series with the inductance and condenser. Then put the clips on the secondary of the oscillation transformer at the point of rough resonance (as determined by the hot-wire ammeter) and find the wavelength emitted by means of the wavemeter; in all probability it will not be within eight or ten meters of the wavelength to which the closed circuit was tuned, which means a broad wave. Next loosen the coupling of the oscillation transformer until the light in the wavemeter just glows, then vary the secondary inductance until the wavelength shown on the wavemeter is the same as the closed circuit was tuned to. The light should now be brighter than before the clips were changed as the two circuits are now in absolute resonance. Next tighten the coupling till maximum amount is radiated, and slowly loosen it until the current drops rapidly off, swing it just to the point where it starts dropping, and the wave should be as sharp as the aerial's decrement will permit. By substituting a detector and pair of phones for the lamp and moving some distance away from the transmitter, it is possible to tell if the wave has two humps, a flat top, or is absolutely sharp, by varying the wavemeter condenser slowly and noticing if the response is stronger in two or more places, over a range of a few degrees, or can be heard loudly in just one definite place. As a rule the same results can be obtained by watching the lamp closely and noting if it lights up sharply in one place or over quite a range, etc. The correct way to use the lamp is to have it just glowing on the maximum point and if it is not incandescent at all over a few degrees on the condenser scale to either side of the maximum point, the wave is sharp enough for practical purposes. It may be necessary now to change the secondary inductance slightly for the change in coupling.

By far the best type of oscillation transformer to use is the hinge type, as it permits the coupling to be changed while the set is in operation and the "critical point" or point where the current rapidly falls off, can be easily determined.

If the current reading on the ammeter is not as great as at the beginning of the tuning, do not think that you will not be able to do as good work as before, as the current now shown is now practically all in one wave, while in the previous reading it was probably in several different wavelengths. As an example: a station here in this city was tuned up in the usual way with an ammeter and the owner was doing good work on the wavelength of 200 meters, when several of the Government stations within a radius of 600 miles

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reported him as working on a wavelength of 1350 meters! All the energy put out at the higher wavelength was worse than wasted.

The foregoing may seem hard as it is read, but it really takes but little more time than the usual method and the results are far more gratifying. Also QRM would not be nearly so bad as it was during our last season if every one would tune their sets in this way as there are quite a good many who have their sets tuned sharply and it is easy to tune them out, while some of the fellows come in with the same intensity from 200 to 300 meters and all work must be suspended until they get thru their business.

A ROTARY GAP OF HIGH QUENCHING

(Concluded from page 19)

shaft which is turning the inner member clockwise at the same speed, and something more than plain bearings is essential to minimize friction.

Theoretical Principles of Radio Telegraphy

By "Speedo"

Marion, Mass.

Dear Eddie—Having visited the author calling himself "The Young Squirt" and succeeded in discovering his source of Moonshine, it has dawned upon me I should write you while I'm still happy. It is my intention to write a few Principles of Radio Telegraphy in an effort to help those who may be timid or doubtful. I thank you.

Yours truly,
Speedo.

THEORETICAL PRINCIPLES OF RADIO TELEGRAPHY

Chapter I

Currents—A current of electricity cannot flow unless there is something to push it. There usually is.

Conductor—This is a substance thru which electricity flows. If it does not flow thru it, the Conductor is an insulator and should be treated accordingly. There are different kinds of Conductors but these work on the New York, New Haven, and Hartford Railroad.

Questions on Chapter I

1.—Is it true that ordinary Currants in buns have magnetic properties with oscillating magnetic fields and static strains at right angles to them?

2.—What formula for resistance would you use on an A.C. bun?

3.—When a Current flows is it true that there must be a force to drive it? Does the force produce the flow, or does the flow produce the force? If so, why not?

Chapter II

Alternating Currents—Alternating Currents flow in opposite directions, but so quickly it is hard to tell which way they are going. They therefore appear to be stationary (not stationery—that's different —that's write.)

When Currents are obtained in this condition they are the cause of all wireless phenomena—known to science. They are measured by hot wires and Government Inspectors.

2.—Oscillating Currents are much worse. You can't tell which way they are going, specially on C.W. So let's not try. We will assume they are going one way or the other. This hypothesis fully explains all the phenomena of aether waves with their static strain lines and magnetic fluxes.

3.—A warning—Do not try to follow an oscillatory current round a circuit. Several nuts have been cracked just this way.

4.—Finally we have (or what they think we have) the Halves of Oscillatory Currents.

5.—Certain High Brows therefore have invented another hypothesis for these Current impulses—that is, that they travel around another circuit called an aperiodic circuit and there transform electrical vibrations into mechanical vibrations which rattle your diaphrams, transporting that which may or may not be intelligible signals, all according to the skill of the operator at the other end.

Some of these diaphram rattlers or oscillations, have been found to have discrepancies in the logarithmic decrement —like 3HJ used to be.

6.—Sometimes oscillation frequency depends on make and break. This is particularly so with squeak boxes, and the cause of much of "The Old Man's" despair before "The Young Squirt" upset his equilibrium by using such language as to make the old man think he was intoxicated with the exuberance of his own verbosity or guilty of superuncounterdistinguishabilitiveness.

Questions on Chapter II

1.—How do Oscillatory Currents flow in two directions at once? Do they meet in

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the middle and bounce back or merely slide past each other?
2.—How would you set about the production of Oscillations in the tympanum of someone's auricular appendage by means of Oscillatory Currents? What apparatus is necessary?

If the Specific Inductive capacity of air = 1, what would be the use of a Condenser under these conditions? Would it work? Does a Condenser ever work? What is the capacity of the air hole in E. I. Phones?

Chapter III

Wireless means without wires. It does not mean no wires are used or even less wires, because it often happens there are more wires. Certainly more wires are wanted.

Wireless waves oscillate and eventually die. This is called damping. There are various kinds of waves—Air Waves, Sea Waves, Hand Waves, Marcel Waves, etc. The magnetic waves — Electro-magnetic waves—are what we are sitting up all night for. They are invisible yet they seem to draw diagrams of them.



LARGE WAVE FIG. 1 SMALL WAVE FIG. 2 NAM WAVE FIG. 3

Figure 1 shows a large wave and Figure 2 a small wave.

The Navy has a wave all its own—especially NAM. This is built specially so it will hook into every other wave, and it's backwards—just to be Navy-like. Figure 3 explains.

Questions on Chapter III

1.—Explain the difference between Marconi and Macaroni. Which is which?
2.—If a train is sent out in the rain does it get damped?

Chapter IV

Detectors—Most anything will do for a detector. The most common things used are as follows—Coke, Coal, Bunsen Burner, Wm. J. Burns, H_2SO_4, iron filings, Fleming Valves, Audions and DeForest lightning arrestors. Wireless Valves were invented by Fleming. He died of them. Any one that ever used 'em will admit it.

Ions play an important part in a Valve. They travel in one direction. It takes more than three of them to cover a pin point. Electricity used to go out of the + Pole but with Valves she's different.

Questions on Chapter IV

1.—Explain the difference between an Ion and an Iron. Who found the first Ion and where?
2.—Draw a diagram of a Coke Detector. Who else besides Springfield amateurs use Coke Detectors?

ADDENDUM

Fig. 4 shows sketch of a Portland, Maine, station which I don't communicate with.

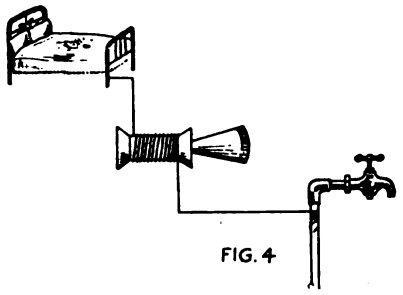


FIG. 4

*The Possibilities of Loop Transmission**

QST receives many requests for data on transmission with loops. In general, loops unfortunately make very poor transmitters, and quantitatively the results approach those obtained from an aerial only as the size of the loop approaches the size of an ordinary aerial. This is of course because the phase displacement between the two vertical sides of the loop is so very small. If the two sides were very close together, neutralization would be practically complete, whereas if they were a half wave length apart, excellent results would be obtained; and between these two limits the results will be in proportion. For best results on small loops, then, very short wave lengths should be employed which, however, would leave them no place in 200-meter affairs. From the following paper those interested in this subject will gain a conception of the values of received energy that are dealt with in such work.—Editor.

IN general, we know a great deal about our T or other aerials. We know, for instance, that range is obtained by height; in fact, that it is directly dependent on the same. Also we know that in

*Author's name withheld by request.

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some way our range improves with antenna current, etc. Our knowledge when loops are discussed is, however, much more limited, and what is more to the point, we rarely if ever know how to compare antennas of these two different types. In the following we will therefore attempt to show what is to be considered in average cases; that is, where two stations are not within a wave length of each other nor, on the other hand, where thousands of miles intervene and correction factors taking into account absorption, reflection, etc., must be employed.

Before all other things we must have a clear conception of the field intensities produced at distant points by our transmitting antenna; if we have that, then it it quite immaterial what type of antenna we are using at the transmitting end. For the sake of clearness we will consider only the electrostatic field, altho we know that wherever such a field exists an electromagnetic field also is to be found, not only at right angles thereto but ninety degrees out of phase with the same. The electrostatic field is expressed in volts per centimeter. If, for instance, we consider two high tension wires one meter apart and with an effective difference of potential amounting to 10,000 volts, we would have a potential gradient of 100 volts per centimeter, which is the electrostatic field.

Now let us consider the field produced by an antenna say 15 meters (49 ft.) in height, operating at 500 meters with an antenna current of 1 ampere. Expressing heights, distances and wave lengths in meters, we find the electrostatic field at a given distance by multiplying the height of the antenna by 18.86 and by the current in amperes, and dividing this by the product of the wave length and distance. Assuming that the receiving station is 6.2 miles or 10 kilometers away, we find our field to be 5.6×10^{-4} volts per cm. This looks very small, but our knowledge tells us that signals with our own set would be very loud at this distance; we therefore can make a mental association of an electrostatic field of a few microvolts per cm. with the signal strength obtainable.

The process when loops are concerned is only slightly different. To obtain the electrostatic field we multiply the loop area by 11.9 and by the number of turns and the current, dividing the whole by the wave length squared and the distance, all measurements being made in meters as before. Suppose we take a coil designed for 500 meter operation, having one meter sides, three turns, and of a resistance which wil allow 4 amperes to flow with the same expenditure of energy as in the first case. Then we find that at a distance of 100 meters, or 328 feet, our field is 5.66×10^{-6} volts per cm., or about the same as before.

In both of the above cases we therefore will be able to get signals of the same intensity. To do so we will, however, be forced to operate at one hundredth the original distance if transmission is with a loop of the dimensions given; and if operated at the original distance, signals would of course be very much weaker. This disadvantage is not of very great importance when suitable amplifiers are available.

Altho we now have a conception of the field intensities dealt with, we should further examine the effect of such a field on our receiving antenna, be it a vertical wire or loop.

Assume first a vertical antenna ten meters high, placed at a point where a field 5.6 microvolts per cm. exists. Naturally the voltage produced is 5.6×10^{-4} times 1000, or 5.6×10^{-3} volts, which if applied to a detector, gives very loud signals. The current produced, if we assume our antenna to have a resistance of 10 ohms, will be 5.6×10^{-4} amperes. These values seem very small but when we realize that relays can operate on currents as low as 5×10^{-5} without any difficulty, we see that we have more than ample energy for receiving purposes. As soon as we substitute a loop, conditions are different and we will therefore proceed to investigate such a case. Before doing this it is of value to consider the table given below, which will enable us to tell very closely what sort of detector we will have to make use of.

Currents required for signals of audible strength

Crystal	10^{-3}	amperes	(Bu. Stds.)	
Fleming Valve	10^{-5}	"	"	"
Regenerative Tube	10^{-5}	"	"	"

Let us choose a loop at random; for instance, a loop having 4-meter sides and three turns. This loop will be at its best at about 500 meters and will serve for our calculation as well as any. The voltage produced in each vertical wire will be 400×5.6 microvolts, where 5.6 microvolts is the electrostatic field at that point. The result will therefore be 2.24×10^{-3} volts. The phase difference must now be considered. It is obtained by multiplying the distance between the two vertical sides of the loop, in meters, by 2π and dividing the product by the wave length. In this case, therefore, our phase displacement will be found to be 5.05×10^{-2}. The voltage produced per turn is therefore 2.24×10^{-3} times 5.04×10^{-2}, or 1.13×10^{-4} volts, and for three turns it will be found to be 3.39×10^{-4}, giving us a current, if our loop has 25 ohms resistance, of 1.35×10^{-5} amperes. From the above table we see that even here a crystal will suffice to pick up the signal, altho the currents

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This A.R.R.L of Ours.

WHILE this old pipe is pulling so nobly, and this belt is so comfortably tight, and this spirit of the New Year is still within us, we are moved to introspection. How many of the lay public are awake to our A.R.R.L.? How many realize what we are actually accomplishing every night in the year? How many suspect that real trans-continental relay traffic is going on as a regular thing; that Scotland already reports hearing us, that ships in South American ports hear us talking, that our radio telephones are already as thick as automobiles used to be, that QST is owned by us and that in its last issue it carried one hundred and twenty pages of which fifty-three were paid advertising, and that the indications are that we have only just begun to move. Honest, fellows, it is some outfit, this A.R R.L. of ours.

Every now and again we meet our worthy predecessor in the Editorial Chair, Mr. Tuska. We love to meet him because it gives us a chance to tell him again of the number of desks we now own, the number of typewriters, the number of rubber erasers, the number and quality of our waste baskets, and the number and fullness of our inkwells. We love to tell him these things, because he always gasps and is led to recount how in his day, he thought the A.R.R.L. was some pumpkins with its one typewriter (hired), one kitchen table (borrowed), one kitchen chair (damaged and donated), one invalid waste basket, the whole assembled in one attic room in his mother's residence. He takes a noisy pride in pointing to the fact that he addressed every A.R.R.L. envelope with his own fists, licked the envelopes with his own tongue, the stamps ditto, and carried the whole in one hand to the mail box on the corner after supper. There were no automatic, double-geared modern dingbobs in his day, if you please.

That was in 1915. This is 1921. There are five of us now in the A.R R.L. office. The entire five would have difficulty in licking the envelopes and stamps which we have to seal every night of our lives. Where the postman used to hand Tuska the A.R.R.L. mail in the morning with one hand, it now takes a husky to get it off the elevator. Where Tuska pounded addresses out on a hired mill, we now run off a hundred a minute in our own nickel plated outfit. which stands on a table all its own. And when the month is done, and QST is ready for the mails, it is not the back seat of Mr. Maxim's touring car that accommodates the bundle. It is a three-ton motor truck.

Yes, fellows, we are growing fast. It proves that our A.R R.L. policies as laid out by our Board of Direction and carried out by our Officers, have been pretty nearly right. It means that we have a fine, strong esprit de corps, which they talk to us so much of in France. It means that we have been able to overlook the little petty things and have kept our eyes on the big, important things. It means that we are able to speak authoritatively to our representatives in Washington. It promises a great and glorious future. We are part of a new and wonderful American development—CITIZEN RADIO. Our Government has already come to recognize what we offer in times of public peril. Our value to our Government will increase in direct proportion as our organization improves in detail. Pretty soon we shall be in the magazine section of some Sunday paper. Just watch, fellows, and see what happens during 1921 to this A.R.R.L. of ours.

Get Down to 200 Meters!

MEN, we are laying ourselves open to serious trouble by our pretty wide failure to obey the wave length law. The law says that a general amateur station shall not use a wave length in excess of 200 meters. How many stations do you hear that you can say are obeying this law? How many do you hear by comparison who are disobeying it? Our observation is that there are all too few who are really complying with the law. It is a sad fact, that observation will show any of you, that the average general amateur tune is right around 240 meters.

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This is bad medicine—except for parties who are looking for something to use against us amateurs, and it will provide them with just what they want. We wish to point out that by our carelessness in this respect we ourselves are creating a danger to our continued peaceful operation. The law gives no station authority to use 240 meters except by special license. It does not say, even, that the amateur wave shall be 200 meters—it defines 200 meters as the MAXIMUM that anybody shall use, and it certainly contemplates that many stations will be working at waves well below 200 meters. Show us some of them today!

If your wave length is 240 meters, you are violating Federal law. You are subject to prosecution and if action is taken against you, you won't have a leg to stand on. Reduce! If your wave length is 230 meters, or 220 meters, or 210 meters, you MUST NOT operate. Cut 'er down. It can be done, and good work accomplished. The A.R.R.L. does not feel that any individual whatsoever is entitled to disregard the law, and we view the present situation with concern. We ask every one of you, Fellow Amateurs, to do your part in eliminating this danger to Amateur Radio. It is a matter for every man to attend to individually. Obey the law—get down to 200 meters

Getting Thru to Canada

BY the time this is in print the wave length of the Canadian amateurs will, we hope, have been raised to 200 meters for the winter, as is customary in that country. Many Canadian stations, they tell us, are tuned up on 200 meters and have been waiting for the word to go, so that we can hope that very shortly in this, our second winter of co-operation with our Canadian friends, our mutual exchange of traffic will start in quantity.

There are certain American amateurs fortunately located who can permanently establish their names in A.R.R.L. affairs if they can succeed in connecting up with the Canadians near them so as to handle traffic. The trunk lines are not definitely formed yet, and we can promise these men that the lines will be flexed so as to run via their stations if they succeed in doing the work. Oh that Ye Ed could be free to operate a station some place where it would be the connecting link to a Canadian trunk line! Why, we'd make 5ZA's fame as a "missing link" look like a Lost Electron.

A little traffic has been moving right along, mainly via 2TF to 8BB, thence to Canadian 2BF; or via 1HAA to Canadian 2CI (formerly 3Z); and 1YB and some of the other college stations up that way are capable of good work into Canada; and from Buffalo some traffic is moving steadily from the Ontario Division. It shouldn't be hard, as Mr. Lorimer advises us that QRM is practically unknown in Montreal after 10:30 p.m. and the U.S. stations come pounding in from all directions. The main essential is that the U.S. stations be close enough to hear the Canucks thru our own QRM.

Which leads us to inquire: What's the matter with Maine? Is everybody dead up there except Castner? You're the fellows we mean when we say that A.R.R.L. fame is waiting a Canadian relayer. Where are the results of that convention? Does Brother Castner labor so hard among you in vain? We have visited you chaps, we have talked with you and seen your stations, and they are good stations, for we used to hear you last winter. Why, then, aren't you on the air—why aren't you trying these good nights to get thru to Canada? They can hear you if you'll only try. We know one of your stations owned by a well-versed amateur, equipped with everything a station desires and fully capable of stepping into this breach this very minute if its owner could be induced to turn on the power and step on 'er! Wake up, Maine, and get in the game.

A Bad Situation

THE Bureau of Standards report to us that over most of the country amateur stations showed a splendid co-operation with each other during the October Fading Tests, but that from the cities of Cleveland and Philadelphia not one single fading curve was received which was at the same time complete and reliable. The trouble was not in the ability of the recorders chosen, for they were excellent men; nor was it from lack of co-operation from the better class of local stations; it was due to wholesale QRM from a lawless element who know nothing of organization or our A.R.R.L., and which consisted mostly of unlicensed spark coil stations. The Bureau goes on to say that reports they have received lead them to the opinion that in these two cities there are more unlicensed transmitters than there are licensed!

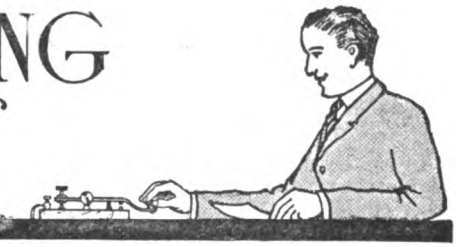
The possibilities for trouble from such a situation are immediately obvious. It is capable of giving Amateur Radio a bad black eye, and it must be remedied at once. In Cleveland, we are happy to say, the status has been much improved since October. Cleveland is a large city which for many years was practically without radio organization, so that such a situation is not so surprising. Now they have an excellent club, the Cleveland Radio Associ-

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THE OPERATING DEPARTMENT

F. H. SCHNELL, 1MO
61 Waverly Bldg., Hartford, Conn.
TRAFFIC MANAGER



TRAFFIC conditions during the past month have improved greatly throughout all divisions. Particular attention is called to the consistency with which traffic is reaching the West Coast through the Southern and Central routes. Ordinarily it was quite a task to get messages across this part of the country. Just now it is only a question of which route should be used, as both seem quite capable of handling any amount, either east-bound or west-bound. The Northern route has not been as successful as the other two, chiefly because of scarcity of stations and the removal to some other part of the country of the ones which had been handling the traffic.

Less QRM

A great number of the clubs have adopted divided working schedules, whereby they permit local work up to a certain hour in the evening, and all work after that time is confined to long distance. The other clubs are falling in line with this idea, and no doubt we will experience even less interference, because this will prevent local stations interfering with long distance stations, eliminating requests for QTA's, such requests always causing further interference, and so on down the line.

Traffic on Schedule Time

The Operating Department is soliciting suggestions regarding DX stations working on schedule, and clearing all traffic in all directions at a specified time each day or night. If you have any suggestions for the furtherance of this plan, please let them come forward.

New England Division

The Traffic Manager made a short trip to several stations in the New England Division and found that local atmospheric conditions or geographical location is one of the main handicaps we have to encounter in working short distances. It is difficult to work from Springfield, Mass., to Worcester, Mass., in the evening because of violent fading of signals between these two points, and because of the terrific interference from stations in the third and eighth districts. It is extremely interesting in view of the fact that the distance between these two cities is about sixty miles and a 1 K.W. transformer with a two step amplifier is being used at the station in each of these cities at which tests were made. We tried for ten nights consecutively to put a message through from Bridgeport, Conn., to Portland, Maine, and while the message reached Portland over the long jumps, we were not successful in getting it past Springfield in short jumps. However we have not given up, nor will we until it is finally accomplished.

SOS de Southern Stations

The Operating Department seeks the names and addresses of wireless amateurs who are located in Virginia, Georgia, Alabama, North and South Carolina. We would like to have some assistance in the way of locating good material for relay stations, and hereby issue an SOS to all members who know of stations that are located in any of these states, who are inactive for some reason or other. Just give us a tip on the prospects, and we will do the rest.

Canadian—U. S. Calls

Considerable confusion in call letters is resulting in the operation between Canadian and United States stations on account of the similarity of call letters. In order that the nationality of both the calling station and the station called may be known, the following regulation is announced for the government of A.R.R.L. stations in both countries:

1. The distinction shall be in the signal used between the letters of the station called and those of the calling station.
2. A U.S. station calling and working a U.S. station shall continue to use "d e" (—.. .)
3. A U.S. station calling and working a Canadian station shall use the intermediate signal "aa" (.—.—)
4. A Canadian station calling and working another Canadian station shall use the intermediate signal "v" (. . .—)
5. A Canadian station calling and working a U.S. station shall use the intermediate signal (— — — .)

Adopt these regulations at once and inform all amateurs in your vicinity of these changes.

Daylight Relays

Daylight relays are coming more and more into favor, if we may judge from the

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present enthusiasm shown in the actual operation of several routes mentioned in the division reports, which follow.

NEW ENGLAND DIVISION
G. R. Entwistle, Mgr.

In spite of the plans developed at the Worcester Convention, the short jump relay chain from New York to Portland still exists only on paper. Breakdowns, both on apparatus and schedules, have resulted in keeping New England in its former condition. The Traffic Manager has made a pilgrimage himself and realizes from personal experience what the situation is. To use his own words—"one would not believe that with 1 K.W. it would be impossible to work sixty miles in certain sections at night". But such is apparently the case around the Worcester section. None of the test messages succeeded in breaking thru from 1FW, altho he was copied direct by 1HAA and 1CK. In fact, Vermilya followed the message as far as 1AW and 1JQ where it stopped. 1CK had copied the original message from 1FW and having followed its progress and seeing 1JQ unable to get it off, sent the same to Portland. There the test message struck a QRM barrage from commercial and naval ship stations.

Considerable development work has been going on, and the D. M. feels that by sticking to it long enough, we will finally break thru. He would like to spend the last 100 years of his life in peace. He has confidence in his A. D. M's.—Castner, Robinson and Mix. Surely if these men cannot push a message thru, it cannot be done. However, we refuse to believe that a message cannot be sent by short jumps from New York to Portland.

In view of the fact that Springfield and Worcester appear to be temporarily isolated, we have attempted to jump around them in an effort to clear traffic. 1GBC in Southbridge, Mass., 1BT in Framingham, and 1WR in Watertown are concentrating on a series of tests in this direction. Another possibility which will produce results if the stations can maintain the proper watch is as follows:

1AW, 1YB and 1OE to any of the following stations in Boston: 1CK, 1DR, 1WR.

One of the greatest difficulties to be overcome is having the men on the various links on at the same time. Outside stations trying to connect with Boston should use 1CK between 10 and 11 P.M., 1DY up to 12 o'clock and 1IS from 12 to 2 A.M., or any others which they may hear asking for traffic.

In order to eliminate some of the superfluous QRM which is greatly evidenced by anyone listening in, the following time schedule is submitted to the New England Amateurs for their benefit:

8 A.M. to 7 P.M. —Free air. Fifteen minutes before and after 12 noon should be kept free from QRM on time signals. The hours from 12 noon to 2 P.M. should be kept free of QRM for daylight QRK tests. All tuning and adjusting of spark and C.W. apparatus should be done before 7 P.M.

7 P.M. to 8 P.M. —Short relays and collection of local traffic. No tuning or testing or QRM during this period.

8 P.M. to 10 P.M.—Period for general communication. Free air. No tuning or testing.

10 P.M. to 8 A.M.—Long distance relays of citizen radio messages.

This schedule has been recommended by First District Radio Inspector Charles C. Kolster. It was drawn up at the first meeting of the Executive Council of Greater Boston, at which representatives from all branches of citizen radio were present.

This time schedule has been sent thru the mail to all licensed amateur stations in New England.

The last period is the most sacred of all, and great care and judgment must be used from 10 P.M. on so as not to interfere with those having practical work to accomplish. C.W. work of all kinds is not stopped at any time of day or night, but owing to the increasing use of rectified A.C., it must give way to citizen relays after 10 P.M. Straight C.W. and voice modulation should cause no interference, and it is the general intention to live and let live provided serious QRM does not result from this kind of work. Care must be exercised in the use of buzzer modulation which produces damped wave trains.

Mr. P. J. Furlong, 1FF, has been appointed City Manager, replacing Mr. L. A. Pulley, whose work prevents his continuance in this capacity. Furlong is also Chairman of the Executive Committee of Greater Boston and gave considerable assistance in the drafting of the time schedule.

District Superintendent, Harold C. Bowen, 1AK, has found it necessary to withdraw from relay work, owing to the lack of time, and 1HAA, Vermilya, succeeds him.

Mr. H. C. Copland, A.R.R.L. Man, an ex-ham from Cambridge, flew into Framingham on his way from Hartford to Portland.

(P.S. Probably he had a bundle of messages from 1AW for delivery in

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Boston.) Hi. Hi. We will get 'em thru some how.

The A.R.R.L. Organization co-operated splendidly with Mr. Copland, 1UQ having supplied him with a landing field at Old Orchard Air Port. Copland is on his way from Portland to Florida and we wish him luck.

1OE in Penacook, New Hampshire, looks like promising material, being able to work both 1HAA and 1AW. He is on the job from 10:30 P.M. to 3 A.M. every night.

Traffic seems to be moving satisfactorily west of Hartford.

1BV, L. G. Cumming, has been appointed Traffic Assistant to the D. M. Headquarters—Room 20, 18 Boylston St., Boston, Mass.

ATLANTIC DIVISION
C. H. Stewart, Mgr.

We have a very comprehensive report from the Northern Section of this Division, comprising the States of New York and New Jersey. Mr. John DiBlasi, Assistant Division Manager, reports as follows:

Conditions in the Northern Section of the Atlantic Division are slowly improving. Mr. Hornung has appointed Dr. E. Cyriax (2DI) as Asst. Dist. Supt. for Manhattan and Bronx He will temporarily act instead of 2YM.

Dr. Cyriax reports that traffic handled by 2DI during the month of November has been comparatively light due to repairs to transmitter. We are in direct communication with mos' . 3 and 8 stations, having cleared messag.. mostly from 1 stations. All traffic from Greater New York has been successfully relayed to different parts of the U.S. Due to the temporary shut down of 2YM, messages were given to 2ZL, Mr. J. O. Smith, of Valley Stream, who is known to be an efficient relayer. 2DI and 2YM will have a definite schedule of working hours.

Mr. Harry Collins, Supt. Long Island east of Jamaica, Babylon, L. I., reports that in addition to the old reliable three of the New England route, namely, 2ZL, 2FS and 2RL, new stations may be added. 2FD is ready. 2AJW has been on the map since spring and has handled considerable traffic, both local and L.D. 2GW at Sayville, and 2EL and 2OE at Freeport, L. I., are also open for relay work.

Station 2FS has been out most of the summer. 2ZL is on the air again with great force, at his new location, Valley Stream, L. I.

Mr. Collins, Babylon, L. I., will be pleased to hear from any stations in this section on matters pertaining to amateur radio furthering the best interests of the A.R.R.L.

Mr. A. H. Benzee, Jr., Acting Supt. Western New York, states that traffic is beginning to come this way, and is being handled promptly. The District has three available routes into Rochester from Buffalo over which traffic can be handled day or night: Buffalo to Lockport, to Medina, to Rochester. Buffalo to Medina, to Rochester. Buffalo to Lancaster (NY), to Medina to Rochester. Traffic can also be handled with Rochester via Lockport or Lancaster direct. 8AJ, Redington, has been appointed official station for Waverly, N. Y., and vicinity We have been endeavoring to get in touch with Waverly and also 8HJ, Young of Elmira. From November 1st to 16th, inclusive, the following traffic was handled in this part of the District: 8IL, Lockport, 4; 8FO, Lockport, 15; 8LB, Buffalo, 7; 8FE, 3. We wish to announce that the call 8FE was assigned to our station in October, and the old call 8AAN is now listed at Utica, N. Y.

Mr. Lester Spangenberg (2ZM) Supt. Northern New Jersey, states that the following stations are doing good work and have kept this District clear. 2OM, Ridgewood, N. J., has been clearing all traffic north and northeast. 2MP, Mr. A A. Hebert, Nutley, N. J., is again on the firing line and has been a good help clearing traffic in and around Newark, N. J., and also in helping the younger ones to comply with the law. The last report is that he was going around to all the younger DX stations with a decremeter tuning up those that before were in danger of being closed down by the radio inspector. Thanks to Mr. Hebert. 2JZ, Elizabeth, N. J., has been most active in handling traffic south. For the traffic that has been well taken care of in and around Jersey City much credit is due 2DF, 2UE, and 2VA. Montclair vicinity has been taken care of by 2JN. In Paterson, Passaic and vicinity, the following stations have been taking care of the traffic; 2ZM, 2QE, and 2ALR. There is a station at Blair Academy (3PU), Blairstown, N. J., operated by Mr. Joel C. Wheeler. The following routes have been laid out for traffic out of this District. and it is requested that all traffic be routed as below:

1. Traffic west and northwest—2ZM
2. Traffic north and northeast—2OM
3. Traffic south and southwest—2JZ
4. Traffic east and southeast—2AIM and 2UE.

It is requested that all local stations QRT local work at 10:30 P.M.

Mr. Burton P. Williams, Traffic Ass't Western Pennsylvania District, states that the following traffic has been handled by official stations during the past month: 8DV—122; 8ZD—114; 8RQ—74. At New Castle, Pa., the Pennsylvania Wireless Manf'g Co. station, operated by Mr. Rex Patch, call 8HA, is taking the place of

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8ADF. We hope to have Mr. Patch's application for appointment, as well as that of the McNarv Brothers in the near future. At Vandergrift, Pa., there is a new station, 8PN, operated by E. C. Espey, who has applied for appointment. This station is doing fine work and is handling a considerable amount of traffic.

8ZD and 8DV are working on schedule, the same as last season. 8CH is no longer heard in Pittsburgh, but is worked regularly by 8DV and 8HA. 8WY is taking care of the northern end of Branch Line No. 2 in fine style. 8MT at Uniontown, Pa., seems to be handling a number of messages. In view of the large number of messages handled so early in the season it is believed that the number will run well over 1500 per month during the coming three months. The traffic in this District is handled at a speed of 20 words per minute, and on account of short jumps on Branch Line No. 2 reports are seldom necessary. The QRM in Pittsburgh is getting worse, and mostly comes from licensed high power stations. There seems to be a number of amateurs in Pittsburgh who know nothing of "QST" or the A.R R.L.

The Supt. for Central Pennsylvania, Mr. Walleze, at Milton, Pa., states that some improvement is noted in his District, and that station 3ABD at Danville, Pa., has handled a number of messages. 3ABD experiences trouble in unloading business to the eastward, and this emphasizes the necessity of handling messages by short jumps.

Mr. S. W. Place, Dist. Supt. Eastern Pennsylvania District, states that there is considerable inactivity in this end of the State. He reports that he understands that C. M. Jackson of Pottsville still expects to be active in the near future. Traffic Assistant Roy C. Ehrhardt reports no messages handled except locally with Wilkes-Barre. Mr. Ehrhardt would like to hear from station owners in his section of the State, and he should be addressed at 117 S. Blakely St., Dunmore, Pa.

Mr. C. S. Horn, Supt for Delaware, states that radio activity does not advance in Delaware as rapidly as in other parts of the country, and that he does not know of any stations on the "Eastern Shore" of Maryland with which stations in the southern part of Delaware might communicate. He advises that stations in Wilmington, Del., are making steady progress, particularly 3BE, and the 3BE has started to use buzzer modulated C.W. His own station 3PM at Rehoboth Beach has been in operation during the past two months.

As the Division Manager is not in receipt of reports from the Eastern Maryland District or from the District of Columbia up to the present time he is unable to give any information on traffic conditions in these Districts. However, from observation at his own station, he knows that stations in Baltimore are working and stations 3HG and 2IY have been heard very well on several occasions, as well as 3KM and 3XF in Washington.

Total Messages 339.

ROANOKE DIVISION
W. T. Gravely, Mgr.

During the past month the Division Manager has been very much pleased at the traffic which has been handled in the Division.

As stated, definite working routes cannot be announced until the various District Superintendents have lashed their stations into shape.

There seems to be an inclination on the part of many operators to handle traffic over long ranges when the short relay method would prove much more effective, and at the same time, create considerable less QRM. There are instances when it is necessary to work at long range. For instance, the line from Danville to the South must be carried on at long range, and this state of affairs will be found to exist in many instances. Efforts are being made to overcome these obstacles. It is very slow work, but there is improvement to be noted each month, which shows that something is being accomplished.

3BZ has been clearing North Carolina Traffic in the day with 4DM at Greensboro. Signals are much better in the day than at night, and in addition, no QRM (other than local Spark coils, which, by the way, are proving a serious nuisance, and which will have to be curbed), no QSS, and rarely ever any QRN. It has been demonstrated that traffic can be cleared with Lynchburg and Winston-Salem, N. C., in the day, and this is breaking up the so-called dead spots effectually. Tests have exceeded expectations.

The Manager had a nice visit this month from District Superintendent F. L. Bunker of Charlotte, N. C., and we have assurance that the old North State is active, and that Charlotte will bloom ere long. There will be good stations in Elizabeth City, Newbern, Wilmington, Greensboro, Winston and Charlotte. We are in need of a good one at Salisbury. (Salisbury please note —let us hear from you).

Our District Supt., Mr. Jno. F. Wohlford, 3CA, Roanoke, Va., is scoring the Manager this month for not saying more about the stations and the activities in his District, so we shall go a little more into detail this time, but let's hope there will be some "real" activities to report befort the next issue of QST.

Mr. Wohlford promises a station at

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Wytheville, one at Oldtown, and one at Salem and an additional station for Roanoke, 3RF. He also states that he is bending his efforts to interest the V.P.I. at Blackburg, the V.M.I., and Washington and Lee of Lexington in relay operations.

Nothing new from the Central Virginia District to report this month, and so far as the Manager is informed, the situation remains unchanged. Mr. Blair, 3HO, at Richmond, Dist. Supt., reports his station in working shape, and also reports one or two others in Richmond who have theirs operating.

City Manager, Norfolk District, White reports everything is going pretty well with the exception of the QRM from NAM which up to this writing remains unchanged. It is practically impossible either to get a message transmitted or to receive one until the wee hours of the morning. Until this menace to efficient l.d. relay work is remedied, our traffic handling will be limited.

Stations 3GO, 3FG and 3VV have handled most of the relay traffic in this territory. There is also another new station which has a range of possibly 200 miles which is located in Portsmouth, call 3ACE, and one in Norfolk, call 3ACT, which will possibly be able to help with relay matters.

We are pleased to state that Mr. Malcom Ferris, formerly V.P. of the P.A.R.A., Phila., Pa., is now an active member of the Hampton Roads Radio Assn.

We wish to thank Mr. Van Nostrand, R. Inspector, of the ports of Norfolk and Newport News thru this report in QST, for his earnest co-operation in all matters in this territory. He is with us in everything that is right and we are exceptionally fortunate in having such a fine man as our Inspector.

3BZ at Danville has handled a number of messages for all points of the compass. Traffic with the south is done through 5DA, 4BY and 4YB; that with the north through NSF, 3KM and the New York Statiens, although the Washington Stations have been clearing some western traffic for 3BZ, and the western traffic is going through 8ZW and 8SP.

3AEV, Mr. Allan Clarke, Asst. Traffic Manager, Danville, is not yet ready with his transmitter.

In conclusion, there is a gradual improvement to be noted all over the Division, which is very gratifying. Any suggestions are always welcome, so you readers of QST who reside in the Roanoke Division, let them come forward. They may prove very helpful. Your Manager is trying to represent you faithfully, but he cannot do so unless he is kept informed. Therefore, let's have suggestions, and constructive criticisms.

DELTA DIVISION
John M. Clayton, Mgr.

Mr. Greenlaw has been appointed Traffic Chief of the Division and it is requested that all stations in the Division forward to him each month by the TWENTY THIRD, a total of the number of messages RECEIVED and a total of the number of messages SENT thru their stations. It is highly important that Mr. Greenlaw be supplied with this information in order that he may compile his report.

Mr. deBen, Assistant Division Manager, reports as follows:

The prospects for several good stations in Tennessee look very encouraging. 5ER of Nashville, Tenn. is handling traffic for that city and seems to be reaching out O.K. now.

Mr. W. L. Barrow reports excellent conditions thruout Louisiana. At present there are stations doing long distance work at Shreveport, Houma, Baton Rouge, Franklinton and New Orleans. 5ZP at New Orleans still handles traffic for east and west down his way.

Mr. Francis Pullen, 5JE of Houma, is doing quite a bit of work now. He has been clearing his traffic to 5ZP.

Mr. Willie Anthony, 5ZS, of Shreveport, is back with us.

Prof. W. L. Kennon of the University of Mississippi, District Superintendent of Mississippi, has rounded 5YE into working shape again.

A Pan-American trunk line will shortly be inaugurated to Central America. Mr. deBen is handling the matter and reports that the arrangements have about been completed. By the time this report is published traffic will in all probability be going thru to Central America and Cuba.

On January first the test messages will start thru the Division. These messages will be somewhat on the order of the old pre-war Trunk Line tests but in this case will originate at 5DA and travel south thru every station doing DX work in the division, to 5YE. When they get to 5YE they will be QSL'ed back to their starting point. It is hoped that by working these tests one night a week for a month, we can get the proper "swing" thruout the division so that traffic coming into the Division and leaving it, may be passed on with the minimum amount of delay.

Correspondence is being had with the West Gulf Division Manager with reference to arranging some schedule for clearing traffic for Texas to his Division. 5ZC fades so at practically all the stations thruout the division that it is next to impossible to work him consistently. It is hoped that we can locate some alternate station so that traffic can be cleared with due despatch to the West Gulf Division.

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5XA at Auburn, Alabama, is handling all the traffic coming from the southeast thru this Division. Arrangements are being made with the East Gulf Division Manager to try to extend the test messages into his division.

5YM and 5ZL have arranged a schedule, a QRM-less schedule, so all stations pse note the following:

5YM will be on Monday, Wednesday and Friday nights from sundown to 12 midnight, and later.

5ZL will be on Tuesday, Thursday and Saturday nights at same hours. Sunday night will be an open night—both stations on the job. All traffic coming this way should be given to either of the above stations. If it is not cleared the same night received, it will be QSRed to the other station for clearance on the next night.

Even now it is possible to say that the Delta Division Fading Tests have been very successful. Particular credit for this is due to a few of the DX stations in the neighboring states who were so kind as to co-operate with us.

It was originally planned to attempt to run the tests without any pre-arranged request for a QRX by stations not acting as recorders, but it was evident from the very first night that all the transmitters in the tests were carrying well to distant stations, and the original plan was modified to include a number of stations at a considerable distance from the transmitters. In order to do anything at all in the way of recording, it was necessary that we try to reduce QRM to a minimum. That's why we asked the co-operation which we did get from quite a few stations. Thanks, fellows, all of you who stood by for us.

Total messages 368.

CENTRAL DIVISION
R. H. G. Mathews, Mgr.

The following changes have been made in the operating department personnel in the Central Division during November. District of Illinois: Mr. Henry Klaus, 9AK, Eureka, Illinois, District Superintendent. Mr. Ivan Frane, 9AQW, Eureka, Illinois, Asst. District Superintendent. Mr. Stanley Byquist, 9ABH, Bloomington, Ill., Asst. District Supt. Mr. Lester Shaw, 9AHE, Streator, Illinois, Asst. District Supt.

In the District of Wisconsin the following stations have been appointed official relay stations: 9DP, E. H. Hartnell, Salem, Wisc.; 9XM, University of Wisconsin, Madison, Wisc.; SF, R. F. Laidlaw, Milwaukee, Wisc. (This station using two letter call while awaiting the arrival of a special license.)

Mr. L. A. Degner, former City Manager of Milwaukee, has resigned because of the pressure of other business. A number of applications have been considered for this position and the new appointment will be announced in the next Central Division report. Conditions at Milwaukee have improved greatly during the past few months and for the first time the messages are being handled with regularity in and out of that city. Heretofore, although the Lake Shore Route has been functioning consistently, Milwaukee has been skipped because of the fact that no station capable of doing long distance work was located there. We now have 9AHO and several others who are handling our traffic in good shape and Milwaukee is an active member of the Lake Shore route. 9DP of Salem has proved to be a very valuable relay station between 9GP of Kenosha and 9MH of Milton, on the Madison branch. 9XM of Madison is on the job handling Madison and other traffic which completes and puts into operating condition the Madison branch. As an alternate to 9XM we now have 9QZ who is getting through in good shape. Station 9HQ has been re-appointed as relay station for Oshkosh, Wisc., inasmuch as this station is now operated by Mr. Becker, succeeding Mr. Lyman. Mr. Becker holds a commercial license.

A daylight route between Southern Illinois and Chicago is finally in operation, the final step to Chicago being accomplished by 9CA who has a noon schedule with Chicago stations. 9NQ at Galesburg is working with 9CA in the daytime. This daylight route is especially useful because of the heavy traffic between Chicago and St. Louis which may now be handled by this means.

Mr. Klaus, the new District Superintendent of Illinois is forming local routes to the colleges in Illinois and would like to hear from institutions who have not yet been placed on operating routes. He can be reached at Eureka, Illinois. Mr. Klaus reports that he has not had much response to his request on the subject of City Manager appointments. We wish to have a live radio man in every city of any size who will take charge of the A.R.R L. organization work and who will handle relay work to and through his city. Radio men residing in cities in which no City Manager has yet been appointed are requested to communicate with the District Superintendent. This holds good for the entire Division as well as the District of Illinois, as we do not have as many City Managers in the Division as we should have. For the information of prospective applicants, the following is a list of the names and addresses of the various District Superintendents in this Division to whom applications should be submitted.

Toledo District (District of Northwest

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hio) Mr. K. A. Duerk, 1000 Wilhelm St., efiance, Ohio; District of Eastern Ohio, r. A. J. Manning, 252 McKinley Ave., alem, Ohio; District of Illinois, Mr. Henry laus, Eureka, Illinois; District of Wisconin, Mr. H. J. Burhop, 623 N. 4th St., anitowoc, Wisc.; District of Southern ndiana, Mr. F. F. Hamilton, 117 S. eridian St., Indianapolis, Ind.; District of orthern Indiana, Mr. H. H. Moore, 922 adison St., Elkhart, Indiana; District of ichigan, Mr. C. E. Darr, 137 Hill Ave., ighland Park, Detroit, Michigan.

Previous appointments in the former istrict of Western Ohio have been canelled and new appointments in the Toledo istrict have been made as follows:

Assistant District Superintendent, Mr. . G. Preston, 8IK, Ashland, Ohio; City anager of Toledo, Mr. Earl Ensign, 8ZB. runk route appointments:

leveland Route: 8ZY, Defiance; 8VJ, Findlay, Ohio; 8GB, Marion, Ohio; 8ZR, Mansfield, Ohio; 8IK, Ashland, Ohio—to Cleveland.

etroit Route: 8ZY, Defiance; 8ZB, Toledo; 8ZZ, Detroit.

olumbus Route: 8ZY, Defiance; 8KP, Lima, or 8VJ, Findlay; 8GB, Marion. Connecting with Miami District thru 8IB, 8EC or 8HG.

On the Cleveland route, stations 8ZR and 8IK will alternate. On the Columbus route, stations 8VJ and 8KP will alternate. In addition to these trunk routes, the following official stations for their respective towns have been appointed, 8DZ, Van Wert and 8HD, Spencerville, Ohio. These routes give quick, positive handling of traffic to Detroit, Toledo, Cleveland and Columbus. It is with pride that we can at last announce sure and speedy handling of traffic to Cleveland, Toledo and Detroit. All of these stations are very well equipped with the latest apparatus and are in charge of good operators.

Notice should be taken of the administrative appointments, particularly Mr. Ensign, City Manager of Toledo, it being his duty to organize the city for rapid distribution and collection of messages, and to secure the co-operation of all stations in Toledo.

Mr. K. G. Preston, appointed Assistant District Superintendent, will have charge of the appointment of branch stations in the eastern half of the district, namely the following counties: Ottawa, Sandusky, Senaca, Crawford, Morrow, Delaware, Licking, Knox, Richland, Ashland, Erie, Huron and Lorain. All stations in this territory desiring branch route appointments, communicate with Mr. Preston. The Trunk Route stations in this territory, will however continue under the supervision of the District Superintendent.

In the Miami Valley District of Ohio appointments have been made by Mr. and Mrs. Candler as follows:

8DI, W. S. Burkhart, Jr., City Manager of Cincinnati, Ohio; 8AFS, Elmer Davis, Assistant City Manager of Cincinnati, Ohio; 8EC, Mr. Fay McDowell; 8IB, Robert Higgy, and 8HG, Paul Breeze, have been appointed relay stations for Columbus and other points. 8FT, L. E. Furrow, Troy, Ohio; 8DC, Warren Wright; and 8IV, Thomas Ried, Springfield, Ohio; and 8AKV, Milton Turrell, Harrison, Ohio, have been appointed relay stations on Cincinnati Route.

Considerable increase of interest has manifested itself in this District during the past month over the summer months. 8FT, Troy, Ohio, 8AKV, Harrison, Ohio, and 8EC, Columbus, Ohio, all do excellent work in daytime. This assures daily communication with practically all parts of this district. 8FT also has been doing fine work with DX at night, being especially able to work western and southwestern stations.

Cincinnati is also coming to the front rapidly under the able guidance of 8DI, while Dayton is also developing some good stations. 8AEE and 8TN are both beginning to reach out. Springfield is handicapped in that its two principal stations are not working regularly.

Recently 8DI carried out a test as to what can be done in the early hours of the morning. He succeeded in keeping in communication with 2XF until 6:20 A.M. one morning and with 2TF until 5:50 A.M. another morning. The work with 2TF was conducted during warmer weather than that with 2SF. A similar test was made at 8ZL during the morning of November 25th. 8ZL communicated with 2SZ until 6:20 A.M. at which time 2SZ reported 8ZL becoming QRZ but sigs from 2SZ remained QSA at 8ZL. From 6:20 to 6:30 A.M. 8ZL and 9WB were in communication with sigs QSA at both stations during the entire time. After 6:30 a few sentences were exchanged with 8OJ, both being QSA with less QSS than is usual between 8ZL and Michigan stations. Practically all of this work was done during and after day-break. Only one step of amplification was used at 8ZL. These tests seem to indicate that very long distances can be covered during daylight hours with the proper equipment. In the afternoon of November 25th 9ZN came in so loud that some difficulty was experienced in reading local stations.

8DI, W. S. Burkhart, and 8AFS, Elmer Davis together with other radio enthusiasts in Cincinnati and adjoining Kentucky towns have formed a radio club to be known as the Tri-State Association. Meetings are held in a club room of the Gibson Hotel. The membership at present, num-

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bers 70 with a promise of 150. W. S. Burkhart was elected President and Elmer Davis Vice-President of the club. There is also an advisory board and a Board of Directors. Committees are also appointed to tune broad stations and to teach the beginner the essentials of radio. Stringent rules were adopted restricting QRM, the time to do local and DX work, and the method of calling CQ etc. We understand that this club has applied for affiliation with the A.R.R.L. Station 8DI has been doing excellent relay work. Station 8AFS promises to become prominent also. We predict great things from Cincinnati in the future. Quite a large portion of the southern traffic has been going over the Cincinnati route to Kentucky and other points in the south. With the help of the members of the Tri-State Radio Association QRM will be greatly reduced in Cincinnati and traffic can move through that section much more readily than heretofore.

In the District of Northern Indiana altho the number of active stations is small, the spirit of co-operation is excellent and traffic work is being handled in spite of the difficulties, by 9FV, 9HR, 9FG, 9FS, 9ME, 9AKH, 9DF and others. A route has finally been worked out whereby Indiana traffic may reach Chicago. This also means a short distance route between the Ohio stations and Chicago which connects Ohio, in turn, with Wisconsin and Minnesota by means of the Lake Shore route which is also a daytime route. In this connection, the Division Manager wishes to call attention to the fact that at the present time messages can be handled over daytime routes from the south end of the Division, Southern Illinois, to the extreme north end, Northern Wisconsin, and from Chicago to the eastern edge of the Division, Eastern Ohio. We believe this to be considerable progress along the lines of short distance daylight communication and hope to carry on even more consistent work over these routes not only during the present long distance season but during the summer season which will follow.

Arrangements are being made for the transcontinental relays to be held in January. The Division Manager wishes to impress on all the participants in these relays the importance of establishing satisfactory communication before the regular message dates, by means of special tests with the stations which they are to work.

The Division Manager has not been receiving the suggestions and criticisms on the handling of the traffic work of the Central Division that he would like to receive. It is not possible that this Division is being handled to suit everybody and accordingly we would like very much to hear from those who are dissatisfied. Criticisms and suggestions alike will be welcomed and we invite you to write us. There are undoubtedly many conditions which could be improved both with regard to traffic and organization work, but it is impossible for us to co-operate with you in making these improvements if we do not hear from you. Please consider this as a personal invitation.

Total Messages 2313.

DAKOTA DIVISION
Boyd Phelps, Mgr.

Having been assured the co-operation of the District Superintendents, the new Division Manager hopes to successfully continue the good work started by Mr. Pray.

We also miss the spark of Mr. Pray's station, 9ZX. Just as the Northern Trunk Line "A" seemed to be working nicely it is a great hardship to have him drop out, and from reports received, 7IM has also left for California. These two stations were the ones that completed the missing link in this route and it will be hard to find their equal as there are not nearly as many good ones to choose from in this part of the country as compared to the other Divisions. With the coming of the Transcontinental Tests the need for efficient stations to fill the gap becomes more imperative. From reports from the direction of North Dakota it appears that all stations in the Twin Cities are received there with great irregularity, at times being very loud and at other time being inaudible, tho stations farther off appear to work the Cities with ease. For this reason it is not deemed advisable to route the test messages thru the Twin Cities although this route would be the shorter. Unless conditions change, it is planned at this time to route the messages via 9ZL to "BQ" or 9AJI to 9ZC to 9WU or 9EE at Ellendale, N. D. There seem to be no stations in North Dakota except in the extreme eastern part so the jump will have to be made from there direct to the 7th district. The connection on the west is now being determined by a series of tests to find the reliability of the communication and at this time the prospects look best for connecting up with 7EX or 7ZG in Montana.

Mr. H. R. Hall, 9FC, 23 Merriam Place, St. Paul, Minn., has been appointed District Superintendent of Southern Minnesota. He was formerly Asst. Supt. and lately St. Paul City Manager. He is planning several branch distributing routes from the Twin Cities to all important towns nearby. If four or five good routes can be organized they will have as their city terminals the best A.R.R.L. stations now taking part in long distance relay traffic. Alternate nights may be arranged to accommodate more

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stations and regular clearing times will be fixed as soon as more good stations become apparent in other parts of the District. This local distribution of relay traffic seems fairer where there are a large number of good stations close together.

Mr. John A. Hall, 9APV, 1016 Iglehart Ave., St. Paul, Minn., has been appointed City Manager of St. Paul. He reports that at present 9HM, 9DR, 9XI, and 9ZT seem to do most of the work to points outside of the Cities. The Twin City Executive Radio Council has made some rules that work out nicely. The hours between 4 and 6 P.M. are reserved for spark coil operation only; from 6 to 9 P.M. for all local work on power input not exceeding 250 watts; and from 9 P.M. to 7 A.M. for long distance relay traffic. We know that if we want the co-operation of everyone we must be fair to everyone. The only exception to the rules is in the case of C.W. and phone. Intercity traffic is now handled by radiophone thru 9ZT and 9APV or 9FC.

Mr. J. A. Gjelhaug, District Superintendent of Northern Minnesota, reports his station 9ZC is about the only one in that part of the state handling traffic regularly as he relays considerable traffic from 9ZL to 9WU. His Assistant, Mr. W. C. Bridges of Superior, reports that 9PN, FWK, and BQ in Superior, and 9AJI in Duluth are the only stations doing dependable work from those cities.

In the Dakotas 9AIG, 9PI, 9WU, and 9EE appear to be the most prominent in relay work. Branch routes are organized in the eastern part of North Dakota.

Mr. E. L. Leavenworth, 9WU, Ellendale, N. D. is Superintendent of North Dakota and Mr. Harold Larson, 9KG, Viborg, S. D. is Superintendent of South Dakota.

WEST GULF DIVISION
F. M. Corlett, Mgr.

Relay weather is with us. With only a few exceptions traffic is moving in a regular business-like manner, and the volume is ever increasing. The handling of messages seems to be one of our chief pleasures so let's see how many we can really handle EFFICIENTLY and ACCURATELY. And remember, a message might as well not have been relayed from station to station if the station at destination doesn't deliver it. By all means DELIVER the messages you receive promptly.

Asst. Div. Mgr. Raymond L. White is doing some excellent organization and detail work which should prove a great help in improving the efficiency of this division and the A.R.R.L. To him is due the credit for collecting the material for the monthly reports.

Mr. H. P. Heafer, 5AJ, newly appointed Dist. Supt. for Northern Texas reports that his District will be second to none in radio activities and the efficient handling of traffic. In the Greenville Territory traffic is moving O.K. in all directions under the direction of Asst. Dist. Supt. C. F. Butcher, 5AL. 5DW and 5IS, Greenville, and 5HV, Commerce, are taking care of traffic in an efficient manner with 5DW in the lead with the number of messages handled. The same is true of the Dallas Territory, traffic moving through with little if any delay to speak of; 5CG, McKinney, 5IE, 5JG, 5ZG, 5EW and 5ZC, all of Dallas, handling the bulk of the traffic. 5ZC will probably lead in the number of messages handled. No report of traffic handled in the Amarillo Territory received, however. Mr. J. L. Martin, 5IF, is being heard. Max Pierce, 5AI, Corsicana Territory, states traffic is coming thru. Waco is the logical relay point for traffic South from Dallas, and in turn should work Austin or College Station. Clyde Mosteller, 5CD, A.D.S., of Pilot Point Territory regrets that he must give up his territory account his removal to Dallas. 5BI in Dublin, Texas, operated by Mr. T. C. House and Guy Neel, is doing some good relay work. A radio Club has been organized in Fort Worth. This is encouraging —we knew Fort Worth would come to the front soon. Now it will be a race between Dallas and Ft. Worth to see which can outdo the other.

Mr. W. H. Tilley, 5ZU, Dist. Supt. of Southern Texas District, is indeed a man of a hard task, in trying to get his District in a 100% condition. In Austin proper there are four relay stations working regularly—5EJ, 5BO, 5JA, and 5ZU, the District Headquarters station. Mr. Frank M. Rives, 5BO, has been appointed A.D.S. and is in charge of the Austin Territory. Houston and Austin are having difficulty in working due to QSS and QRM from broadly tuned stations. NAY is very QSA on 200 meters. (Ditto in Dallas too.) Mr. Ed. Nettleton, 5ZN, Eagle Pass Texas has been appointed A.D.S., and assigned the Eagle Pass Territory consisting of the Counties of Edwards, Real, Kinney, Uvalde, Maverick, Zavalla, Frio and Dimmitt. James L. Autry, 5ZX, has dismantled. He is a senior at Rice and lives on the campus. Among the interesting news of the Houston Club is the appearance of a bi-monthly, typed and illustrated periodical giving the interesting sidelights on the local operators, their equipment and outstanding characteristics.

Mr. Louis Falconi, 5ZA, Dist. Supt. New Mexico, reports weather conditions in New Mexico perfect for relay work. Traffic on the Southern Transcontinental Route is going thru regularly. At Douglas, Ariz., 6IG and 6GE are both effective stations, while 6ZH at Richfield, Utah, opens an-

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other way West and Northwest, and 6JT at Salt Lake City further helps in the good work of making the Southern Route reliable. 5IF at Amarillo, Texas, has been heard and connection with him should be established soon. Mr. Goddard, A.D.S. of the LasCruces Territory, reports many improvements are being made at the State College Station.

M. C. Poor, 5EF, Asst. Dist. Supt. of Southeastern Oklahoma Territory, is anxious to get a line on all stations in his Territory. His address is 437 West Grand Ave., McAlester, Okla. A half K.W. station has been located at Krebs and will probably be ready to go before long. Mr. Poor has requested the newspapers to help him locate the amateurs in his Territory. Newspapers, as a rule, will assist by giving us a little publicity and are the means of reaching newcomers in the amateur game. No mention of traffic conditions was made in Mr. Poor's report.

Asst. Dist. Supt. C. M. Selby, 5BM, of Muskogee, in charge of the Northern Territory of Oklahoma, states that his station has not been completed.

5HL at Oklahoma City is being heard at Headquarters in Dallas now quite frequently.

Total messages 174.

ROCKY MOUNTAIN DIVISION
M. S. Andelin, Mgr.

This division is now in shape to handle transcontinental traffic over trunk line "B", which seems to be the shortest and most logical route from coast to coast. Since this division finally got to working after the summer dead spell it has already proven its worth and importance in handling traffic. Most of the messages go thru 6JI and 6ZH at Richfield, Utah. Stations East can be worked with more ease than western stations. Traffic going east has to go by way of 5ZA, Roswell, as we have found that to be the most reliable route. However, messages have been received with certainty from other stations. 9LR at Anthony has given us a fine direct route but on account of QRM in his vicinity it is impossible to transmit to him. A large number of messages has been received direct from 9AEG at ElDorado, Kans.; 9IF, Giltner, Neb.; and 9WU, North Dakota. The latter is received very QSA at Richfield and seems to be very reliable to work as he does not QSS as much as stations closer. However, QRM has to be contended with. 6WV at Denver has a 2 bulb transmitter and is making a record with his set and has proven very efficient in relaying traffic.

Western stations are very QSA and messages can be received with certainty but we find it very difficult to transmit to them as they have so much QRM that it is impossible to work them continuously. Messages have been sent direct to Los Angeles. 6EJ at Sunnyvale and 6BQ at Reno appear to be the most reliable to work as they haven't as much QRM to contend with.

Mr. Glen Garner, 482 22d St., Ogden, Utah, is appointed District Superintendent for Northern Utah and Southern Wyoming. Mr. Garner has a DX station in Ogden with the call of 6RE, operated conjointly by Garner and Flygare.

Mr. Ira Kaar is back and puts Salt Lake City on the radio map.

Total Messages 108.

NORTHWESTERN DIVISION
John D. Hertz, Mgr.

Ever hear of "listening hours"? Well, we've got 'em. Between nine and ten P.M., Monday and Wednesday nights. What are they? Ever hear a station, very weak, calling some station two thousand or more miles away, and just as he was about to "sign" some local station within five or six hundred miles would suddenly "jam" the ether? Well, we have all heard such things, at least out on this coast, so we have "listening hours". Now all the "local" stations QRX for an hour twice a week, and everybody strains their ears to get the "sign" of these stations that may be in the Ninth, Fifth, or even Eighth district. To accomplish this, arrangements have been completed with the Pacific Division, thru Mr. Bessey, Manager, to have all stations in that part of the country, and all stations in the Northwestern Division QRX during the above mentioned hours.

Stations handling traffic in this Division have suddenly become scarce. This is due to the increased interest shown in things DX, and a resulting rebuilding and remodeling of stations.

East-bound traffic goes entirely via 7CC at Moscow, Idaho to stations in the ninth district. In order to facilitate the handling of traffic over this route it is requested that all stations to the south and west of station 7CC refrain from calling 7CC unless called by that station. This to apply from nine P.M. until eleven P.M. This will give him a chance to clear his business with the stations east of him at a time when they are on the job and can be worked. This is especialy desirable while it is necessary for 7CC to work thru to the Ninth district, and do it regularly.

Traffic from this Division is handled from almost any station in the Division to "sixes" too numerous to mention.

Montana

H. E. Cutting, at Bozeman, says he will do all in his power to keep his end of the Division "well greased". He has applied

(Continued on page 65)

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HUBERT E. DE BEN

Mr. deBen's spark, 5ZP, is being heard far and wide, and we are glad to meet him in the pages of our QST. His organization work and A.R.R.L. boosting is a further reason for his nomination for the Hall of Fame.

Mr. deBen was born in 1900. He started in the radio game in 1915 and in the whole five years of his experience no mishap has befallen him, in spite of threats from neighbors whose lights blinked and who were kept awake until ungodly hours with the noise of his gap. He is now attending Tulane University, and for the last four years has gone to sea as a commercial operator during vacations.

Our readers will be surprised to know that 5ZP is but a half kilowatt station, as a glance at the "Calls Heard" column will show that he is being heard over most of

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JOHN D. HERTZ

This introduces to QST readers Mr. John D. Hertz, 7ZB, Vancouver, Wash., Manager of our Northwestern Division.

Hertz has a darned good name for a radio man—he ought to make a go of it He was born in Minneapolis in 1901, went west in 1907, and has since lived in o around Portland, Ore. Started in radio in 1914 and went the usual route, first breaking into long-distance receiving in 1916 when he made the acquaintance of an audion, but then living in a community without juice, the transmitter was a 1½ inch spark coil, known by the call 7MC

For the past several summers he has held a berth as commercial operator a KXV, Nelson Lagoon, Alaska, and put in one winter between San Francisco and Honolulu, but his winters are now given to A.R.R.L. work and under his energetic

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The A.R.R.L. announces with pleasure the completion of the affiliation of the following additional societies, dating from Nov. 20, 1920:

Montgomery County Radio Association, Montgomery County, Pa.
Ridgewood Radio Club, Ridgewood, N. J.
The Cleveland Radio Association, Cleveland, Ohio
Worcester County Radio Association, Worcester County, Mass.
Bath Radio Association, Bath Maine
Jefferson City Radio Club, Jefferson City, Mo.
Bridgeport Radio Club, Bridgeport, Conn.
Brookline Radio Club, Brookline, Mass.
"Y" Radio Club, Santa Barbara, Calif.
Eureka Radio Club, Eureka, Ill.
West Side Radio Club, Chicago, Ill.
Radio Club of Mansfield, Mansfield, Ohio
Manitowoc Radio Association, Manitowoc, Wisconsin
Monterey Radio Association, Monterey, Calif.
Wauwatosa Radio Club, Wauwatosa, Wisconsin
Akron Radio Club, Akron, Ohio
Radio Club of Central High School, Minneapolis, Minn.
Y.M.C.A. Radio Club, Minneapolis, Minn.
Radio Association of Western New York, Buffalo, N. Y.

Second District Executive Council

Recently seven prominent clubs in the Second District met at the Y.M.C.A. Radio Club, 153 E. 86th St., New York, and formed the Executive Radio Council of the Second District for the purpose of administering to traffic conditions in their territory. The Radio Inspector sits as Chairman, and the balance of the council is composed of a vice-chairman, secretary, and a trial board formed of two representatives from each affiliated club in the District. Mr. John DiBlasi has been elected Vice-Chairman.

Traffic regulations were adopted, providing for free air until 7 p.m., local traffic 7 to 9:30 p.m, long distance traffic 9:30 to 12 midnight, and free air after midnight. Each club is to appoint a traffic director for the zone covered by its activity and he is to be responsible for conditions in his zone.

This arrangement should result in a speedy improvement in traffic conditions in the New York district.

Springfield Traffic Rules

At a meeting of the Springfield Radio Assn., Springfield, Mass., Nov. 2d, regulations were adopted declaring open air 6 a.m. to 7 p.m., local traffic 7 p.m. to 10 p.m., and DX relay work 10 p.m. to 6 a.m.

Newly elected officers for the next six months are: President, H. Dyson; Vice-Pres., J. Moauro; Sec., Geo. I. Pierce; and Treas., G. Marois.

New Club in Ft. Worth

On Nov. 10th amateurs of Ft. Worth, Tex., together with Division Manager F. M. Corlett and District Supt. Heafer, met and organized a radio club, electing for officers, Yewell Cornelius as president, R. L. Harris as vice-president, and K. E. Madden, of 3108 Hemphill Ave., as secretary and treasurer.

We are very glad to see a good club started in Ft. Worth, and wish the new organization every success. They now have an excellent start for a live, peppy club.

Central Michigan Radio Assn.

On Nov. 18th the Central Michigan Radio Assn., of Lansing, held its second annual banquet, at which new officers were installed as follows: President, Roy Saddler, 8QQ; Vice-Pres., Paul Tousley, 8JJ; Secretary, Maurice Pancost, 8ZF; Treasurer, Mr. Edgar Ferguson, 8QS.

After a good feed the program featured interesting talks, music, stunts, and an electrical show.

Michigan is on the map, all right. Many of the stations of this club are doing excellent work, particularly 8JJ and 8FI, who have been heard this season in 24 states.

Milwaukee Amateurs' Radio Club

The Milwaukee Amateurs' Radio Club has started the present radio season with the idea of one big radio club for the city of Milwaukee and has absorbed the Wisconsin Radio League and has extended its activities to the surrounding towns with the purpose in view of bring the amateurs into closer contact with each other.

A new meeting place has been secured through the courtesy of the School of Engineering of Milwaukee. The rooms

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Engineering Library

are located on the sixth floor of the Old Insurance Bldg., 373 Broadway. As usual the regular meetings are held weekly but on Monday evenings at 8 p.m. instead of Thursday. Of late the meetings have been devoted to discussions of QRM and its mitigation. The Club has adopted the "Chicago Plan" of control of traffic and a set of Traffic Rules and Regulations has been worked out and distributed thruout the city. These rules are enforced by the A.R.R.L. City Manager and the Committee on Interference and Relays. A very noticeable improvement in traffic conditions has been the result. The Club wants every amateur in the city of Milwaukee to become a member of the organization and an invitation is hereby given to all parties concerned to attend the very next meeting of the Club that shall be convenient to them. There are several grades of membership open, making it possible for anyone that is interested in Radio at all to become a member. The dues are low in comparison to the benefits that are derived by the membership at large.

The Club is affiliated with the A.R.R.L. and is working in conjunction with their operating staff on relaying, QRM, and for the best interests of amateur radio communication. The Chicago Executive Council has asked the Club to become affiliated with them and this is now under consideration.

Address all communications to the club to 601 Enterprise Bldg., Milwaukee, Wis.

Traffic rules and regulations, as adopted, provide for free air 6 a.m. to 7 p.m., local traffic 7 p.m. to 10 p.m. and DX traffic only from 10 p.m. to 6 a.m. and on Sunday mornings from 6 a.m. to 11:30 a.m. The regulations define the manner of handling traffic and provide for the enforcement of the rules. Amateurs in Milwaukee vicinity who are not acquainted with these regulations should request a copy from the Club.

Troy Y.M.C.A. Radio Club

Troy's first radio club was organized in 1914 and was known as the Amateur Marconi Radio Assn. After a struggle for existence, this club united with the Y.M.C.A. in 1916 and became known as the Troy Y.M.C.A. Radio Club. Apparatus was purchased and a station erected, but the war depleted the ranks of the club's membership and no more meetings were held until the fall of 1919, when the club reorganized, re-erected and improved the station, and immediately started very good reception, copying 9EE and 9LR on a homemade regenerative set and one bulb. The station is situated on the third floor of the Y.M.C.A., hemmed in with tall buildings, and until recently was not able to do much in the way of transmitting. A counterpoise solved their trouble, however, and now 2SZ is reaching out, having been QSO 9LM, 9JT, and several DX 8's and 2's lately.

Mr. F. Clifford Estey, President of the Essex County Radio Assn., was a recent visitor, and thru the enthusiasm he injected, a convention is planned for after the Xmas holidays of all radio men in Schenectady, Albany, Troy, and surrounding vicinity.

Meetings are held every second Monday evening in the club's own quarters, and if any DX men are ever in Troy, they are cordially invited to visit 2SZ. Communication with other clubs is desired, and should be addressed to the Secretary, J. D. MacKnight, Y.M.C.A., Radio Club, Troy, N. Y.

Radio Club of Brooklyn

Radio Club of Brooklyn, N. Y., announces that its meetings are now being held on the second and fourth Wednesdays of each month at its new headquarters, 2211 Bedford Ave.

The club has investigated traffic conditions in its vicinity and as a result is laying out local traffic lines thru Brooklyn connecting with 2RK thru the medium of a central traffic station, not yet appointed, for both incoming and outgoing traffic. Non-member stations are included as well as club stations, the routes being really an extension of the A.R.R.L. trunk lines, and all Brooklyn amateurs are asked to co-operate.

Southern California Radio Assn.

The above club, with headquarters at 510 Y.M.C.A. Bldg., Los Angeles, has commenced the publication of a club sheet, known as S.C.R.A.Q.R.M. It has the pep, and with the co-operation of its membership, we know that from its first small copy it can be developed into an organ that will be a thing of joy to the gang. Good idea.

Bay Counties Radio Club

QRM conditions in the Frisco district have become so serious that the above club, with headquarters in Oakland Calif., has proposed a time-division schedule which, with the co-operation of the rest of the amateurs, should gradually result in the elimination of unnecessary interference and a great improvement in general operating conditions. The schedule provides for free air and tuning, 6 a.m. to 6 p.m., local unimportant business 6 p.m. to 8:30 p.m., local business 8:30 p.m. to 10 p.m., and long distance work from 10 p.m. to 6 a.m.

Springfield Radio Association

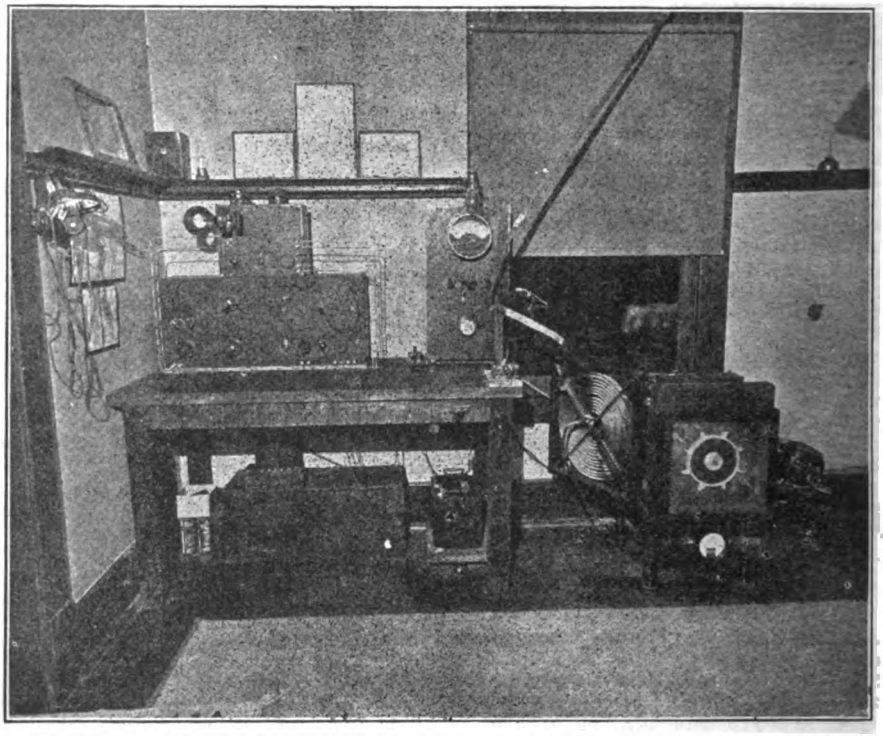
In the month of April, 1920, a little band of Springfield radio "hams" met in a small room in the First Highland Baptist Church. They drew up a constitution,

(Concluded on page 68)

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[redacted] 5ZA, ROSWELL, N.M.



We published photographs of 5ZA last fall but here we have a much better picture of this excellent station, also showing some improvements which its owner, Mr. Louis Falconi, has since installed.

It is easy to see why 5ZA does good work—it's not all location; give the boy credit—he has an efficient station. Note the business-like arrangement of the transmitter. The transformer is a 1 K.W. Thordarson; the condenser is of glass plates immersed in oil; the oscillation transformer is of heavy ribbon, in pancakes, with the secondary hinged so as to swing, which makes coupling adjustments very easy; the gap is an 8-point Hyrad enclosed in a glass-front case, belt-driven from the motor at the extreme right, and he also has an Amrad quenched gap. The transmitter is assembled as a compact unit, mounted on insulators on the floor. Note the open circuit leads of wide ribbon, providing plenty of surface for the high-frequency currents.

Falconi complains that his antenna current is low—"only" 4.1 amps with rotary and 5 with quenched. But that's because he has a real ammeter—a thermo-couple ammeter which reads correctly at any frequency. Most of the high readings we

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read about exist only on the scale of an incorrect meter.

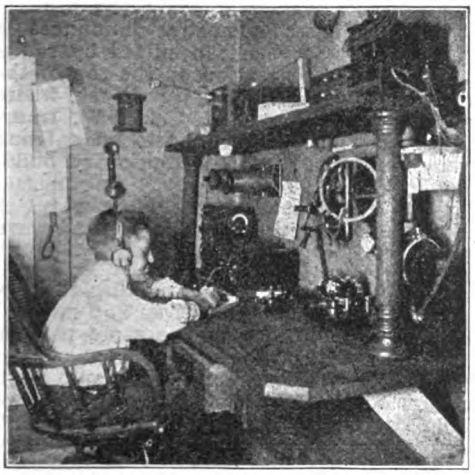
5ZA's relay receiver is a regenerative tuner, detector, and two steps enclosed in the good-looking-made cabinet shown. A honeycomb set is used for long waves, and may be plugged into the same tube equipment.

We compliment Mr. Falconi—his station is arranged as a real relay station should be. It is not surprising that 5ZA's signals have been reported QSA at 2RK, Brooklyn; 7CU, Vancouver, Wash.; and 9EE, Ellendale, N. D. Actual communication has been had with 7IM, 6ZH, 9EE, 6SK, etc. 5ZA continues our best route to the West Coast.

5JI, HOUSTON

This is the station of one of our younger A.R.R.L. members, Fred Mahaffey, 12 years old, 5JI, at Houston, who, in addition to belonging to our League, is a member of the Houston Radio Club, attends high school and the Y.M.C.A. radio school, is an accomplished violinist and an enthusiastic Boy Scout.

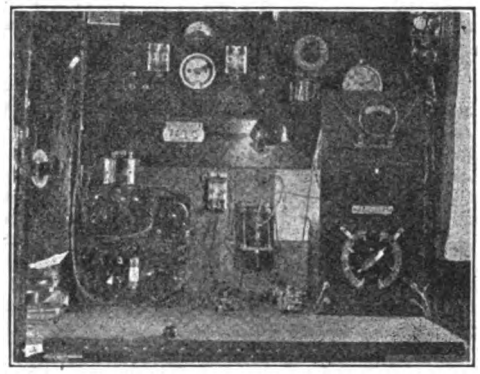
5JI has a half K.W. Thordarson, Dubilier



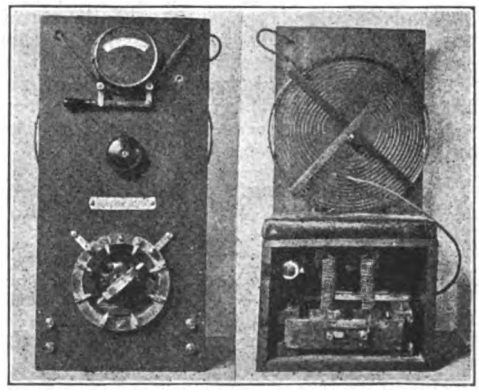
condenser, Murdock O.T., and rotary gap. We don't know what his tuner is, but the detector and two-step are Grebe make, and he hears the DX amateurs. 5JI has a nice looking station but we would point out to him that he could get a great big improvement in efficiency by rearranging his transmitting apparatus so the parts are closer together and the leads shorter. He should strive to reduce the total length of connecting leads between gap, O.T., and Dubilier to the very fewest possible inches. We think he might get an idea on this from the photograph of 5ZA in this issue.

7AD, SEATTLE

Here is the station of Mr. F. J. Brott, 7AD, Seattle, which will offer suggestions to the man who "makes his own", as almost all of this apparatus is home-made. The panel transmitter is the most interesting part, and the rear view of it is shown in our second photograph. The transformer and rotary are enclosed from the



rear, but the gap proper is mounted on the front of the panel, together with the aerial meter and knob for adjusting the closed circuit. This seems to be a simple pancake set, with the inductance mounted on the rear of the panel, and the condenser is on top of the compartment containing the transformer, and immediately below the pancake. That this arrangement is efficient for small sets is attested by the fact that,



while the input is but 180 watts, communication has been had with 6FE, 460 miles, 7CC, 200 miles, and 7ZB, 140 miles, with signals reported from other points up to 625 miles.

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As Dr. Goldsmith says, "There is a discouraging decisiveness about the action of a vacuum tube when it burns out."

Mr. A. L. Groves advises us that the Lafayette station is using the call letters LY, instead of LAF as mentioned in last QST. The signals tune in using a Duo-Lateral 1500 as a secondary, shunted by a 43-plate condenser at 150 degrees; or with a Honeycomb 1500, at 164 degrees on the same condenser. This station has a press schedule beginning at 8:30 p.m. Eastern Standard Time (01:30 G.M.T.), with signal strength at least three times that of POZ or YN.

A U. S. Coast Guard cutter has been named after Frank J. Taylor, a well known Cambridge boy who lost his life during the war when the coast guard cutter Tampa was sunk by the enemy. Frank Taylor is well remembered by the older amateurs around Boston. A. C. Zwicker, of the Acme Apparatus Co., tells of the time when he (Zwicker) had the radio amateur fever and installed some apparatus, and, upon listening in one night, could get no signals. The next morning he found that his antenna lead-in had been disconnected and brought in thru the window of the apartment below, in which a new family had moved the day before. While standing around and wondering about this, Frank Taylor appeared and explained that he would like to borrow the use of the antenna for the previous night. From which we may know that he was a regular amateur.

"The transmitting starts at 8 o'clock on a wave length of 425 miles."—Hartford Times. Almost an ocean by itself.

H. L. Owens, 9EL, asks us to QST the fact that his address is incorrectly shown in the Consolidated call book as Topeka, Kan. It should be 822 East Main St., Council Grove, Kan.

The Traffic Manager offers one-fourth inch from the filament of a burnt-out wooden audiotron to the man who invents an improvement on the salutation "Sa OM".

8TY reports a fellow over the other night who asked who the amateur with the loud 500 cycle set was. We wonder how he gets down there, too. But cheer up, 8TY, maybe Santa Claus left NAM a wave meter.

There is a certain amateur aerial on the outskirts of a town near here of which we wish we could get a photograph for QST. It is fearfully and wonderfully made. Across the top of the town gas tank a flat-top of sorts is supported on two horribly rickety sticks, and from this imposing structure, high in the air, a lead is run thru thin air a distance of about three hundred feet, over the tops of intervening houses, to the roof of the station owner. It must be meant for a transmitting aerial, or it would not be multi-wire, and we would hate to be the company issuing the insurance on that gas tank.

The DeForest company announces a nightly news service transmitted by radiophone from their station on the top of the World's Tower Building, New York, where one of their type OT-201 1 K.W. transmitters has been connected to an antenna running to the top of a four-story building at 49th and Broadway. An unusual feature is the location of the apparatus at the top of the antenna. The licensed wave length is 1650 meters.

Have you heard NSF repeating the signals of MUU, POZ and YN on 250 meters? This is accomplished in the same manner as the repeating of the time signals from Arlington. We only hope NSF don't reach up and get some of the crazy atmospherics from the long waves and goof up 250 meters with some extra strays.

Newspapers recently chronicled the complete destruction by fire of the DeForest plant, with a loss of a half million dollars. Dr. DeForest advises us that this is far from the truth. The fire apparently started from crossed wires in the tube department, which was completely destroyed, but the rest of the plant suffered very little, the finished stock being practically undamaged. The loss totaled about $40,000, fully covered by insurance.

2ABK suggests that a phonograph record used for a rotary disc should assist in securing a musical tone. This idea is

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awarded the set of oilcloth diaframs.

New Books Received: The 1920 Year-Book of Telegraphy & Telephony, distributed by the Wireless Press, Inc., New York; price $4.00 postpaid. The 1920 edition of the annual compendium of radio information, made famous by the Marconi company. A 1200-page book packed full of information of high value to amateur and engineer alike.

Rumor has it that on November 18th Mr. E. H. Armstrong sold his regenerative and oscillating audion patents to the Westinghouse company.

With deep regret we record the death on October 30th of Mr. James Murdock, of the firm of Wm. J. Murdock Co., Chelsea, Mass., makers of "Murdock 55's". James Murdock was a fine man, who had the interest of the amateur at heart; he was deeply interested in amateur and club work, and gave freely of his time. Amateur Radio will miss him.

What would you think of a chap who told you he was employing "two units of thermionic note magnification"? Would you yell for a Size 18 Wouff-Hong? Honestly, tho, that is the terribly precise term which our British confreres stick on a harmless two-step amplifier.

Dear Eddy—

Noting illustration of Doolittle decremeter in last QST, "A" contends the brass cup is for water to dampen the wave, while "B" contends that this cup gathers the dampness from the damped waves and the scale measures the amount of damping like a rainfall gauge at the Weather Bureau. Who it right?

Oscillation Oscar.

Nothing doing—we don't pretend to be an authority on anything but C.W. Above is referred to the Advisory Technical Committee.—Ed.

Radio Testing Station, Binghamton, N. Y., announces its ability to receive orders for radio material via radio, thru its station, 8LI. Such orders in most cases can be shipped C.O.D. the following day.

"The way QST keeps growing, another six months and each copy will be delivered in a wheelbarrow."—R.T.A. Bulletin. Tnx, OM. You define our ambition. Incidentally, our own congratulations on your peppy little sheet.

2RK—the sleepless wonder; never eats, never sleeps; only "radios".—R. T. A. Bulletin.

Referring to our Editorial on "7HH", last month. Somebody is feeding 1HAA a diet of phony calls. Who is the "4CM" he worked? It wasn't the real 4CM at Sewall's Point, Fla. Can it be possible there are two? Maybe "4AO" over in Jersey has changed his call? When all this business comes to light—Oh Boy!

Important Notice

Editor QST has received authority to announce two prizes offered by The Old Man for the best and the rottenest fist among A.R.R.L. DX men. All DX men are asked to send their votes to QST for count. Contest closes Jan. 31st. Come on.

S. Kruse has an interesting short article on operation on buried wires, in the November issue of the Washington Radio Bulletin, published by the Washington (D.C.) Radio Club. The article describes the reception and transmission results of 3HS, that city, who has been consistently copying 1AW, 8ZL, 8ZW, and a host of closer stations, on a single tube in a tickler feed-back circuit, using a ground wire of No. 22 D.C.C. buried four inches under sod. As the wire has been in place several months, the insulation may be neglected as having no effect. The buried wire has a total length of about 55 feet and instead of being straight it is run around three sides and part of the fourth of a rectangular yard, thus pretty well eliminating directional effect. A gas-pipe ground is used. Signal-static ratio is much improved, and a peculiarity is that nearby stations are received only a trifle stronger than distant ones. A series condenser is used in the ground lead; it tunes very broadly.

WOULDN'T IT BE WONDERFUL—

If some phone operators would turn mute, or would put a pebble in their mouth, or would spit out the mush, or something?

If we could send half as well on 250 meters when we try to, as NAM does when he is trying to use 952?

If the Bureau of Standards started to trail its missing VT-1's? (Ask Kruse—he knows.)

If 6FE had a decrement? (Hi!)

If DeForest would have a fire sale for the next ten years?

If 1XT could make a C?

If 3DH would get a key that wouldn't stick?

"If 25-cycle juice was at least 40 or 50 cycles, so that a sink gap would give a 'new' tone, instead of a rattle?", say the cunux.

If copper screen antennas would strain our wave and make it pure?

If 9ALG could discover an ice-proof condenser oil that wouldn't freeze?

(Concluded on page 67)

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CALLS HEARD

On account of the vast quantity of calls reported we must ask your co-operation in the following.

(1) List the calls on a separate sheet of paper—do not embody them in a letter.

(2) Arrange by districts from 1 to 9, and alphabetically thru each district; and run them across the page, not down a column.

(3) Put parentheses around calls of stations also worked.

(4) Omit initial or other unauthorized calls.

(5) State the period covered by your report.

HEARD BY M. B. LOWE, Operator on "KDF" Oct. 30 and 31, 200 miles south of South Pass, La. (290 miles S. of New Orleans: 3VV, 4XC, 5AO, 5AL, 5EJ, 5XA, 5XB, 5XC, 5YA, 5YH, 5ZC, 5ZL, 8ZW, 9ABI, 9HT, 9JN, 9KO, 9LM, 9LR, 9OX, 9ZC.
Heard by same operator while lying at dock at Puerto Barrios, Guatemala, Nov. 3 and 4th: 2RK, 5EJ, 5FL, 5YH, 5ZA, 5ZC, 5ZL, 5ZP, 5ZU, 5ZZ, 8ARB, 9AEG, 9BW, 9LR, 9ZJ, 9ZL, NSF. 2RK loudest by several times.

NSF, ANACOSTIA, D. C., Oct. 21—Dec. 5.
1AK, 1AW, 1BBL, 1BL, 1BM, 1CAY, 1CK, 1CM, 1CZ, 1DY, 1EAT, 1EAV, 1FQ, 1GB, 1GBT, 1GY, 1HAA, 1HO, 1JAP, 1JQ, 1JZ, 1KE, 1OE, 1PY, 1RY, 1RZ, 1TS, 1WR, 1XE, 1XT, 1XX, 2ACM, 2AEF, 2AER, 2AM, 2ARD, 2BB, 2BG, 2BK, 2BM, 2CT, 2DA, 2DN, 2DR, 2EL, 2GI, 2GR, 2HN, 2IL, 2JJ, 2JU, 2JZ, 2OA, 2OO, 2PL, 2RM, 2RK, 2SH, 2SZ, 2UE, 2VA, 2WB, 2WD, 2XJ, 2XQ, 2ZD, 2ZE, 2ZL, 2ZM, 3ABD, 3ACS, 3AFV, 3AHK, 3BE, 3BG, 3BZ, 3DH, 3DR, 3EH, 3FB, 3FQ, 3GO, 3GX, 3HG, 3HJ, 3IY, 3OU, 3PU, 3VV, 3ZA, 3ZG, 3ZS, 4AG, 4AL, 4AO, 4BK, 4BQ, 4DM, 4XC, 5YB, 5AO, 5BC, 5DA, 5ER, 5FV, 5XA, 5YE, 5YH, 5YI, 5ZL, 5ZP, 5ZZ, 8ABG, 8ACF, 8ACJ, 8ADE, 8AGP, 8AHR, 8AL, 8AMQ, 8AMZ, 8ANO, 8AY, 8BP, 7BQ, 8CB, 8CG, 8CV, 8DC, 8BG, 8DI, 8DP, 8DR, 8DV, 8DZ, 8EC, 8ER, 8EV, 8EW, 8FD, 8FK, 8FP, 9FT, 8GI, 8GW, 8HA, 8HH, 8HI, 8HP, 8HY, 8IK, 8IL, 8IN, 8IV, 8JF, 8JJ, 8JQ, 8JU, 8KE, 8KN, 8KX, 8LB, 8LF, 8LQ, 8ML, 8MNG, 8MZ, 8NI, 8NZ, 8OY, 8PN, 8RE, 8RQ, 8RW, 8SH, 8SP, 8TN, 8TT, 8WC, 8WY, 8XE, 8XK, 8XU, 8YV, 8ZA, 8ZB, 8ZD, 8ZL, 8ZN, 8ZR, 8ZV, 8ZW, 8ZX, 8ZY, 8ZZ, 9AAF, 9ACL, 9AD, 9AEG, 9AEK, 9AJI, 9AK, 9AOJ, 9AP, 9AU, 9BW, 9CA, 9CP, 9DP, 9EL, 9EQ, 9ET, 9FG, 9FM, 9GN, 9GX, 9HN, 9HT, 9JN, 9JQ, 9KN, 9KV, 9LC, 9LM, 9LR, 9LQ, 9OE, 9PL, 9PV, 9SS, 9UH, 9UU, 9VA, 9XM, 9YB, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZV, 9ZX.

F. H. SCHNELL, 1MO, HARTFORD, CONN., Nov. 10 to 30.
1AZ, 1BM, 1CK, 1CZ, 1DY, 1GY, 1JQ, 1OE, 1FAQ, 1ACQ, 1CBQ, 1HAA, 1UAV, 2DN, 2EL, 2JJ, 2OX, 2RK, 2TF, 2XQ, 2ZD, 2ZL, 3BG, 3BQ, 3DH, 3DS, 3GO, 3HG, 3HJ, 3JJ, 3JQ, 3KM, 3KH, 3TU, 3VV, 3XF, 3AHK, 4DM, 4YB, 5DH, 5AB, 8AD, 8CV, 8DA, 8DI, 8DP, 8DR, 8DV, 8FK, 8FY, 8GB, 8GI, 8HJ, 8HP, 8HW, 8IK, 8JF, 8JS, 8JU, 8KM, 8KP, 8LB, 8LF, 8MT, 8NA, 8NI, 8OM, 8PI, 8PN, 8QJ, 8RQ, 8RW, 8SP, 8TC, 8TT, 8WY, 8XK, 8XU, 8ZA, 8ZB, 8ZD, 8ZE, 8ZL, 8ZR, 8ZV, 8ZW, 8ZY, 8AAW, 8ABG, 8ACF, 8ANG, 8ANJ, 9AU, 9AT, 9BP, 9CA, 9EL, 9GC, 9HN, 9HP, 9KV, 9LM, 9UU, 9ZL, 9ZN, 9ZV, 9AAV, NSF, WWV.

9RR, KANSAS CITY, MO., Nov. 1—9. On indoor antenna twenty-five ft. high.
1HAA, 2ADD, 2RK, 3DH, 3GO, 4AG, 5EJ, 5FL, 5YH, 5ZA, 5ZC, 5ZL, 5ZP, 5ZT, 5ZU, 5ZV, 5ZZ, 6WV, 7CC, 7IM, 8ABR, 8ABP, 8EB, 8FT, 8HA, 8LW, 8QJ, 8YV, 8ZY, 9ABI, 9AEG, 9AEQ, 9AEU, 9AFX, 9AEY, 9AGN, 9AHI, 9AHZ, 9AIG, 9AJI, 9AKI, 9AKJ, (9ANQ), 9APC, 9AQR, 9CA, (9DU), 9EE, 9FB, 9EQ, 9FU, 9GN, 9GP, 9HN, 9JQ, 9KV, 9KU, 9LR, 9LC, 9MS, 9NX, 9OE, 9QM, 9TY, 9VR, 9WR, 9WU, 9WZ, 9XM, 9YN, (9ZH, 9ZJ, 9ZL, 9ZN, 9ZT, 9ZV, 9ZX, NSF, WWV.

1AW, HARTFORD, CONN., Nov. 3—Dec. 3.
(1AK), (1AZ), (1BM), (1CK), 1CZ, (1CM), (1DY), (1FQ), 1GJ, (1GY), (1JQ), (1QN), (1UJ), 1YB, (1OE), (1FAQ), (1HAA), (1JAP), 1MAH, 1UAV, (1UAW), (2CS), (2DN), 2HX, 2JJ, 2JU, 2OA, 2OM, 2RK, 2SZ, (2TF), 2WB, (2XQ), 2ZD, (2ZL), 2ZM, 3BH, 3BG, 3BZ, 3CL, 3DS, 3DH, 3EH, 3FG, 3FV, (3GO), (3HJ), 3HG, 3HX, (3KM), 3MX, 3QW, (3VV), 3YV, 3ZE, 3ABC, 3ACI, (3ACM), 3ABH, 3AHK, 4AG, 4AL, 4BY, 4DM, (4YB), 5YE, 8AY, 8BP, 8CF, 8DC, 8DV, 8DI, (8DH), 8DY, (8EB), (8FJ), 8FI, 8FT, 8FP, 8GW, 8HY, 8HI, 8HA, 8II, 8IK, 8JF, 8JU, 8JJ, 8KP, 8LF, 8LG, 8ML, 8NF, 8NI, 8PP, 8QM, 8RW, 8SH, (8SP), (8TT), 8UH, 8UV, (8WY), 8XE, 8XU, (8XK), (8ZZ), 8ZX, 8ZV, 8ZE, (8ZY), 8ZB, (8ZD), (8ZL), 8ZR, 8ZA, 8ZW, 8ANP, 8ANJ, 8AMQ, 8AMZ, 8ACF, 9HR, 9LQ, 9XM, (9ZJ), (9ZL), 9ZN, (NSF), WWV.

K. B. WARNER, HARTFORD, early November.
1FQ, 1JQ, 1OE, 1TS, 1XT, 1FAQ, 1HAA, 1GBO, 2DN, 2DA, 2BK, 2EN, 2GO, 2JJ, 2JZ, 2RK, 2TF, 2XQ, 2ZD, 2ZL, 2ACM, NSF, WWV, 3BG, 3BZ, 3DC, 3DH, 3GO, 3GX, 3HB, 3HH, 3HG, 3HJ, 3JJ, 3KM, 3OR, 3VV, 3ZS, 3ABD, 3AHK, 4AA, 4DM, 4YB, 5DA, 5YH, 8AH, 8AY, 8BP, 8DV, 8ER, 8FK, 8GW, 8HA, 8HP, 8JJ, 8JU, 8JS, 8LF, 8ML, 8MT, 8OJ, 8OM, 8PN, 8RQ, 8SP, 8WY, 8XK, 8ZA, 8ZC, 8ZD, 8ZE, 8ZL, 8ZR, 8ZV, 8ZW, 8ZY, 8ZZ, 9AU, 9HF, 9HN, 9KV, 9LC, 9LQ, 9UU, 9XM, 9ZC, 9ZJ, 9ZL, 9ZN.

1TS, BRISTOL, CONN., November, one-step.
(1AAT c.w.), 1AK, 1AN spk. & c.w., (1AW), 1BAB, (1BBL), 1BBO c.w., 1BM, (1CBX), 1CJ, (1CK), (1CM), 1CZ, 1DAP, 1DH c.w., 1DR, 1DT c.w., (1DY), (1EAS), 1EAV, 1EN, 1ER, 1FAQ, 1FBF, (1FQ spk., c.w. & fone), 1GAI, 1GBC, 1GJ, 1GY, 1HAA, 1HO, 1IAP, 1JAP, (1JAU), 1JD, (1JBF), 1JN, (1JQ), 1KAQ, (1KAY), (1KAZ spk. & c.w.), 1MX, (1NAQ), 1NO c.w. and fone, (1OE), 1OT, 1PAO, 1PAW, 1PG, 1PY, 1QN, (1RU spk. & c.w.), 1RZ, 1SAC c.w., (1TAZ), 1VAA, 1VAD, 1VG, 1WAP, 1WP, 1WR, 1XD fone, 1XE spk. & fone, (1XT), (1XV c.w. & fone), (1XX c.w.), (1YB), 2ACM, 2ADD, 2AER, 2AFZ, 2AJE c.w., 2AJW, 2AM, 2AZP, 2ASB, 2BAR, 2BB, 2BD, 2BK, 2CL, 2CS, (2CT), 2DA, 2DN, 2EL, 2HN, 2HX, 2HZ, 2JJ, 2JR, 2JU, 2JZ, 2KY c.w., 2MZ, (2NN), 2OA, 2OM, 2OX, 2PL, 2QB spk., c.w. & fone, 2QV c.w. and fone, 2QW, (2RK), 2RM, 2RV, 2SH, 2SZ, (2TF), 2UE, 2WB, 2WD c.w., 2WG, 2XF fone, 2XI c.w. & fone, 2XJ fone, 2XJ 4 fone, (2XQ c.w. & spk.), 2XX c.w. & fone, 2ZL c.w. & fone, 2ZM spk., c.w. & fone, 3AAP, 3ABD, 3ACM, 3ACS, 3AHK, 3BE, 3BZ, 3CC, 3CS, 3DH, 3DR, 3DS, 3FB, 3FR, 3GO, 3GX, 3HB, 3HG, 3HJ, 3HO, 3KM, 3OB, 3PM, 3PU, 3QW, 3SJ, 3SW, 3TJ, 3UC, 3VV, 3XF, 4AL, 4DM, 4XB c.w., 4YB, 5DA, 5YM, 8AAN, 8ABG, 8ACF, 8AEE, 8AFB, 8AGZ c.w., 8AHP, 8AJW, 8AMQ, 8ANJ, 8AP, 8BP, 8CB, 8CG, 8CH, 8CV, 8DI, 8DP, 8DV, 8DY, 8DZ, 8ER, 8EV, 8EW, 8FB, 8FG, 8FK, 8FO, 8FT, 8GI, 8GY, 8HA, 8HF, 8HH, 8HI, 8ID, 8IL, 8IN, 8IV, 8JF, 8JJ, 8JS, 8JU, 8KE, 8KP, 8KZ, 8LF, 8LW, 8MH, 8ML, 8MP, 8MRG, 8MT, 8MZ, 8NI, 8NZ, 8OE, 8OJ, 8PI, 8PJ c.w., 8PN, 8PQ,

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8QJ, 8QM, 8RI, 8RQ, 8RU, 8RW, 8SH, 8SJ, 8SP, 8TB, 8TT, 8VJ, 8VS c.w., 8VY, 8WD, 8WJ, 8WY, 8XC c.w., 8XE, 8XI, 8XK c.w. &fone, 8XU, 8YV, 8ZA, 8ZB, 8ZD, 8ZE, 8ZG spk. & c.w., 8ZL, 8ZR, 8ZV spk. & c.w., 8ZW spk. & c.w., 8ZY, 8ZZ, 9ABL, 9AD, 9AKF, 9AN, 9AO, 9AU, 9BP, 9CA, 9CG, 9DT, 9FV, 9GN, 9GP, 9GX, 9HI, 9HN, 9HM, 9HR, 9HY, 9JN, 9JQ, 9JT, 9KN, 9LM, 9LQ, 9ME, 9OE, 9QQ, 9UU, 9XM, 9YA, 9YI, 9ZJ, 9ZL, 9ZN, 9ZY.

HEARD ON GALENA BY E. RAGERSE, Opr., S/Y CASIANA.

Nov. 12th, 30 miles S.W. of Hatteras: 1AW, 1RZ, 1GBT, 2BM, 2EL, 2JZ, 2WB, 3BG, 3HJ, 3UO, 4AL, 4BY, 4CP, 5DA, 8ACF, 8AFB, 8DP, 8KP, 8SP, 8ZY, 9KV.

Nov. 13th off Jupiter Inlet, Fla.: 2WB and 8AY (QRN bad).

Nov. 14th 70 miles S.W. of Key West: 2JU, 3GO, 5ZK, 8ZL, 9LG.

N. R. HOOD, 1022 S. ASH ST., CASPER, WYO., Oct. 26—Dec. 5.

5CG, 5EL, 5HL, 5JI, 5SL, 5YH, 5ZC, 5ZL, 5ZZ, 6BJ, 6EJ, 6FE, 6HI, 6IG, 6ZA, 6ZH, 7CC, 7EG, 7EJ, 7FE, 7JM, 7IM, 7WM, 7ZQ, 8DQ, 8ZL, 9AK, 9AP, 9AT, 9AU, 9AX, 9BW, 9DE, 9EE, 9EO, 9EL, 9ET, 9EW, 9FL, 9GC, 9GN, 9HI, 9HT, 9IV, 9IF, 9JD, 9JN, 9KO, 9KN, 9KQ, 9KU, 9KV, 9LR, 9LW, 9MS, 9OE, 9PM, 9PI, 9QR, 9RU, 9SC, 9WI, 9WR, 9WT, 9WU, 9ZC, 9ZL, 9ZN, 9ZQ, 9ZU, 9ZV, 9ZX, 9ABX, 9AED, 9AEG, 9AEQ, 9AEU, 9AEY, 9AIG, 9AKC, 9ALG, 9ANB, 9ANQ, 9AOO, 9APC, 9ATL, 9AUP, 9IFX, NSF, FWK, 9AFX.

5ZC, DALLAS, November.

3GO, 4AL, (5AL), (5AO), (5AJ), (5AI), (5BI), (5BO), 5BV, 5CA, (5CG), (5CI), (5DW), 5ER, 5EF, (5ES), 5EA, (5EW), (5EJ), (5FL), 5FE, 5HF, (5HV), (5HL), (5IB), (5IE), 5JS, (5JT), 5JA, 5JY, (5KK), (5YH), 5YE, (5XA), 5XB, (5ZA), (5ZZ), (5ZL), 5ZF, (5ZU), 5ZAC, (5ZT), (5ZG), (5ZP), 5ZK, (5ZW), (5ZN), 7ZL, 8ZU, 8ZV, 8SK mod. CW, 8ZR, 8DW, 8KP, 8AN, 8ZY, 8HS, 9AC, 9AP, 9AY, (9AEG), 9ACN, 9ANQ, 9AIG, 9ACK, 9BW, 9DV, 9EE, (9EL), 9FU, 9FI, 9FL, 9GC, 9GK, 9HI, 9HN, 9JN, 9JI, 9JK, 9JU, 9JQ, 9KV, 9KO, (9LR), 9LC, 9OE, 9OG, 9OT, 9PI, 9PC, 9PU, 9TH, 9UQ, 9WV, 9XM, 9XT, 9XP, 9YI, 9YA, 9ZL, 9ZN, 9ZJ, 9ZT.

9ZN, CHICAGO, Oct. 15 to Nov. 1.

(1AW), 1HAA, 2BB, 2BM, 2CM, 2JZ, 2RR, (2RK), 2XC, 2ZL, (1CW), (3BZ), 3EB, (3DH), 3GO, (3KM), 3RY, 3VV, 3XF, 3YB, 3ZA, 3XL, 4XC, 5CG, 5EL, 5ER, 5HA, 5XA, 5XB, (5YH), 5YM, 5ZC, (5ZL), (5ZZ), (8DV), (8HG), (8FT), (8DI), (8ER), (8ML), (8ZW spark and phone), (8HH), (8CB), 8GB, 8MZ, 8AW, (8XK spark, 1 CW and phone), 8TT, 8JJ, 8ZC, (8ZG spark and CW), (8ZD spark and phone), 8EO, 8AAP, (8IK), 8EC, 8DG, (8LF), 8WY, 8VX, 8DP, 8ZB, 8ZA, 8PW, 8XC, 8FK, (8DI), 8MM, 8XU, 8ACF, 8MR, 8MT, (8HA), 8FD, (8BP), 8OJ, 8ACF, 8LA, 8JS, 8AKV, (8DG), (8RW), (9JT), (9GP), (9KV), 9KO, 9LQ, 9AOJ, (9LR), 9AP, (9CA), 9NQ, 9HR, (9HM), 9CV, (9GN), 9AON, (9ZO), (9AOJ), (9AEQ), 9FU, (9ZX), 9CO, 9OE, 9AEG, 9AMQ, 9AAP, 9AAF, 9PI, (9CS), (9LC), 9NP, 9QJ, 9FR, 9HY, 9WY, (9ZL), 9VL, 9LP, (9AJI), 9AIG, (9ZV), 9ZQ, 9FG, (9JN), 9ABI, (9WU), 9LX, 9QE, (9EE), 9ZR, 9JQ, (9EL), 9AJR, (9AUG), (9ZJ), 9YI, 9KQ, 9WZ, 9AKC, 9MS, 9AEY, 9AON, 9ACB, 9EQ, (NSF 1 CW and phone).

9HT, OMAHA, NEBR., Oct. 16 to Nov. 6.

(2RK), (5AL), (5CG), (5EJ), (5YH), (5ZA), (5ZU), (5ZZ), 8DI, (8ER), 8FK, 8WT, 8ZB, 8ZC, (9CA), 9EE, (9EL), 9ER, 9FG, 9FU, (9GC), (9GN), 9HI, 9HN, (9JN), (9KV), 9LM, (9LR), 9NQ, (9OE), 9PN, (9UU), (9WU), 9XM, (9XT), 9ZC, (9ZH), (9ZL), 9ZN, 9ZQ, 9ZT, (9ZX), (9ABX), 9ACB, (9AEG), (9AEQ), (9AEU), (9AFX), 9AIG, 9AIM, (9AJI), (9AJS), 9ANQ, 9AON.

1BT, FRAMINGHAM, MASS., 10/1919-10/1920.

NSF, 1AW, 1BK, 1BM, 1CM, 1FM, 1IW, 1NO, 1QL, 1RZ, 1SZ, 1TS, 1YB, 1ZC, 1AAZ, 2AS, 2BB, 2BM, 2BO, 2CB, 2CC, 2CK, 2DA, 2DI, 2EL, 2GR, 2II, 2JU, 2JZ, 2LI, 2NB, 2NC, 2NF, 2OU, 2SH, 2TS, 2VD, 2XF, 2XJ (spk. and fone), 2XM (fone), 2ZC, 2ZL, 2ZM, 2ZN, 2ZS, 2AJW, 3BZ, 3CC, 3CM, 3CR, 3CT, 3DH, 3EN, 3KH, 3KM, 3LZ, 3NB, 3NC, 3NV, 3ZA, 3ZC, 3AA, 3AL, 3AH, 3BP, 3BU, 3CC, 8DA, 8DH, 8EN, 8ER, 8FW, 8HA, 8HG, 8HP, 8JS, 8JU, 8SH, 8TT, 8XK, 8XU, 8ZK, 9AS, 9MS, 9ZJ, 9ZN, Canadian 3Z.

Heard at 8AMQ, ROCHESTER, N. Y. Oct. 16-28th.

1AK, 1AW, 1HAA, 1XK (phone), 2BB, 2DH, 2ZW, (3DH), 5ER, 5FH, 5ZL, 5ZP, 8ABG, 8ACF, 8BP, 8CB, 8DV, 8ER, 8FO, 8FW, 8HH, 8ID, 8KE, 8KP, 8LA, 8MM, (8MT), 8OJ, 8QB, 8RW, 8SH, 8TT, 8XX (phone), 8XU, 8YV, 8ZA, 8ZD, 8ZP, 8ZG, 8ZW, 9EQ, 9AJ, 9FQ, 9GC, 9HK, 9KF, 9KM, 9KN, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZW, 9ZY, NSF.

9MH, MILTON, WIS., Oct. 1-16.

4XQ, 5CM, 5DW, 5YH, 5ZC, 5ZL, 5ZZ, 8ER, 8FT, 8HG, 8KP, 8MT, 8NI, 8QZ, 8TT, 8XK, 8ZB, 8ZG, 8ZW, 9AP, 9AAF, (9AFB), 9AJI, 9AJN, 9ACV, 9BW, 9CA, 9CS, 9DF, 9FI, 9FT, 9FU, 9GC, 9GP, 9HM, 9HR, 9JJ, (9JT), 9KV, 9LQ, 9LR, 9ME, 9NQ, 9PN, 9WZ, 9YA, 9ZK, 9ZL, 9ZN, 9ZV.

9OY, SOUTH BEND, IND., Sept. 13th to Oct. 18th.

1AG, 1AK, 1AW, 1DQ, 1EP, 1HA, 1XD, 1XJ, 1HAA, 2AO, 2BK, 2DN, 2EL, 2GR, 2II, 2JU, 2JZ, 2LM, 2LR, 2PU, 2PZ, 2RA, 2RK, 2RR, 2RV, 2XO, 2XX, 3AB, 3AE, 3BH, 3BL, 3BZ, 3DH, 3DS, 3EN, 3GO, 3HG, 3HJ, 3JK, 3KM, 3LP, 3NB, 3OG, 3VV, 4AE, 4AP, 4BG, 4BN, 4BQ, 4CC, 4CE, 4CP, 4DM, 4LB, 4XC, 4XK, 4YA, 5AI, 5AO, 5BA, 5CD, 5OG, 5DA, 5DW, 5ED, 5FV, 5IS, 5LW, 5ST, 5ZC, 5ZL, 5ZP, 5YH, 8AA, 8AF, 8AL, 8AM, 8AR, 8AY, 8BO, 8BV, 8CB, 8CD, 8CF, 8CI, 8CW, 8DC, 8DG, 8DI, 8DJ, 8DK, 8DN, 8DP, 8DR, 8DV, 8DZ, 8EF, 8EJ, 8EN, 8ER, 8EV, 8FA, 8FD, 8FG, 8FI, 8FS, 8FT, 8GC (QRA?), 8GS, 8HB, 8HG, 8HH, 8HR, 8HV, 8ID, 8II, 8IM, 8IN, 8IU, 8JF, 8JJ, 8JS, 8JV, 8KC, 8KE, 8KG, 8KP, 8LA, 8LF, 8LG, 8LK, 8LL, 8LW, 8MC, 8ML, 8MM, 8MO, 8MR, 8MT, 8NI, 8NL, 8NZ, 8OG, 8OI, 8OJ, 8ON, 8OZ, 8PE, 8PW, 8QJ, 8RT, 8RU, 8RW, 8SH, 8SP, 8TT, 8UD, 8UJ, 8UO, 8UP, 8VA, 8VJ, 8WP, 8WY, 8XB, 8XC, 8XD, 8XK, 8XH, 8ZA, 8ZB, 8ZC, 8ZD, 8ZG, 8ZW, 8ADE, 8ACF, 8ZB 8ACU, 8AEA, 8AEY, 8AIO, 8AFS, 8ARY, 8EOO, 9AD, 9AF, 9AP, 9AN, 9AQ, 9AR, 9BY, 9AT, 9CI, 9AU, 9CP, 9AV, 9CS, 9CU, 9DF, 9DL, 9DV, 9EE, 9EL, 9EP, 9EQ, 9ER, 9EZ, 9FB, 9FD, 9FG, 9FL, 9FS, 9FT, 9FU, 9FV, 9GC, 9GJ, 9GN, 9GS, 9GX, 9HA, 9HM, 9HR, 9HW, 9HY, 9IB, 9IP, 9JR, 9KO, 9KV, 9KW, 9LA, 9LC, 9LG, 9LH, 9LM, 9LQ, 9LR, 9LZ, 9ME, 9MI, 9NI, 9NQ, 9OE, 9OJ, 9OR, 9OS, 9OX, 9PC, 9PD, 9PN, 9QM, 9RP, 9RT, 9RY, 9TT, 9US, 9UU, 9VA, 9VG, 9VL, 9VS, 9WC, 9WZ, 9XD, 9YQ, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZV, 9AAF, 9AAW, 9ABI, 9ABL, 9ABZ, 9ACB, 9ACM, 9AEC, 9ACV, 9ADO, 9AEG, 9AEQ, 9AIN, 9ALY, 9AMT, 9AFB, 9AIM, 9AEV, 9AJI, 9AON, 9AKH, 9MEP, 9API, 9ANK, 9AFX, 9ARD.

3OU, BALTIMORE, Sept. 25 to Oct. 9.

1AW, (1CK), 1EP, 1HAA, 1PY, 1SZ, 2BK, 2BM, 2CT, 2DF, 2DN, 2EL, 2HN, 2JU, (2RK), 2SH, 2UE, 2WB, 2ZL, 3BG, 3BZ, 3DC, 3EN, 3FG, 3BL,

POSSIBILITIES OF LOOP TRANSMISSION

(Concluded from page 30)

under consideration are only one tenth as large as in the case of the 10-meter antenna.

Based on the above, we can estimate that operation between the two loops we described can be carried on over one kilometer by merely making use of a vacuum tube detector, and 10 kilometer by the use of an amplifier.

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8BA, 8HJ, 8KM, 8JK, 8VA 8VV 8ZW, 4CC, 5DA, 5AO, 8AC, 8BV, 8CB, 8DI, 8DR, 8DV, 8EN, 8ER, 8EV, 8HG, 8JS, 8KE, 8LA, (8NI), 8SP, 8SS, 8TT, 8WY, 8ZK, 8ZA, 8ZE, (8ACF), 8ICN, 9AP, 9ZN, 9HM.

7ED, PORTLAND, ORE.

6AE, 6AK, 6AT, 6AV, 6BJ, 6BN, 6BQ, 6BR, 6CC, 6CD, 6CE, 6CO, 6CP, 6CS, 6CV, 6DK, 6DP, 6EA, 6EB, 6EJ, 6ER, 6EX, (6FE), 6FN, 6FS, 6FX, 6GK, 6JD, 6JI, 6JK, 6JM, 6JN, 6JQ, 6IM, 6UM, 6SK, 6QR, (6OH), 6AAT, 6AAW, (7AD), 7AN, (7BK), 7BH, 7BC, (7CE), 7CB, 7CC, (7CW), 7IN, 7IM, 7YB, (7YS), 7ZH.

7GY, BOISE, IDAHO, Aug. 16 to Oct. 15.

6AK, 6AM, 6AN, 6AT, 6BB, 6BK, 6BJ, 6BQ, 6CO, 6CV, 6DP, 6EA, 6EB, 6EJ, 6EN, 6ER, 6EX, 6FE, 6FG, 6II, 6IF, 6IK, 6IU, 6ID, 6JI, 6JL, 6JM, 6JN, 6JR, 6KA, 6MZ, 6OH, 6PJ, 6QR, 6QM, 6DK, 6UM, 6ZE, 6ZG, 6AAW, 6ACR, 6AAT, (7AD), 7BH, 7BQ, 7CB, 7CC, 7CK, 7CR, 7CW, (7CU), 7DA, 7DS, 7FH, (7FM), 7FO, (7FT), 7FY, 7GQ, (7HG), (7HJ), 7HN, 7IM, 7IN, (7IV), 7XB, (7YA), 7YG, (7YS), 7ZH, 7ZI.

8IZ, MILAN, OHIO.

1AW, 1BW, 1TS, 2BB, 2DX, 2VA, 3AB, 3CX, 3EI, 8KF, 8IK, 8GJ, 8JF, 8LE, 8ER, 8HH, 8MM, 8ADL, 8GX, 8OI, 8SP, 8ZA, 8CB, 8ZG, 8HA, 8HI, 8ZF, 8TP, 8JU, 8JQ, 8XK, 9XQ, 9AP, 9JH, 9HR, 9HS, 9ZN, 9US.

6JD, LOS ANGELES.

5ZA, 6AH, 6AS, 6CV, (6OH), (6DP), (6QR), (6BQ), (6GE), (6PJ), (6II), (6BN), (6JN), (6EX), (6AN), (6ZE), (6JR), (6CO), (6OC), (6AT), (6QM), (6EJ), (6AK), (6EP), (6AE), (6AM), (6JI, 6ZB, 6MZ, daytime, San Diego), (7CU), (7ZI), (7DA), 9LR.

Heard at 9FD, LAFAYETTE, IND.

NSF, 1AW, 1WL, 2NC, 2RK, 2XX, 2ZL, 3DH, 3EN, 3ER, 3GN, 3NB, 3NC, 3NW, 3XH, 4AE, 4BQ, 4YA, 5BT, 5LL, 5XA, 5YE, 5ZL, 5ZW, 5ZZ, 8AC, 8BAT, 8BO, 8BP, 8BW, 8BX, 8CB, 8CP, 8DA, 8DG, 8DI, 8DK, 8DP, 8DR, 8DV, 8EJ, 8ER, 8FG, 8FT, 8GA, 8GN, 8GQ, 8HG, 8HH, 8HK, 8HP, 8ID, 8IK, 8JJ, 8LA, 8LH, 8LP, 8LW, 8MT, 8NEA, 8RQ, 8RY, 8WC, 8WR, 8XA, 8XK (phone), 8XY, 8ZA, 8ZF, 8ZG, 8ZD, 8ZJ, 8ZW, 8ZY, 9AA, 9ABR, 9ACE 9AD, 9AEG, 9AG, 9AGA, 9AIG, 9AJI, 9AK, 9AP, 9AU, 9BK, 9CA, 9CD, 9CE, 9DF, 9DI, 9DL, 9EF, 9EG, 9ER, 9EN, 9GNT, 9GV, 9GX, 9HM, 9HR, 9HT, 9IJ, 9IP, 9JH, 9JJ, 9KN, 9KV, 9KX, 9LJ, 9LR, 9LQ, 9MO, 9NT, 9PI, 9PY, 9QJ, 9RA, 9RL, 9RP, 9RR, 9TT, 9VP, 9VS, 9WG, 9WO, 9WP, 9WZ, 9XX, 9VB, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZV.

1GG, SOMERVILLE, MASS., Oct. 17 to Oct. 24.

1AW, 1SN, 1TS, 1HAA, 2BB, 2BK, 2BM, 2DN, 2EL, 2GR, 2KN, 2RK, 2TF, 2ZL, 3AB, 3AJ, 3BC, 3BG, 3DH, 3DK, 3FR, 3GB, 3HJ, 3JZ, 3KL, 3KM, 8ND C.W. QRA?, 3PU, 3ZD, 3ZW, 8AY, 8CB, 8CH, 8CP, 8ER, 8HA, 8HH, 8HP, 8JS, 8ML, 8WR, 8XU, 8ZD.

9FS, GOSHEN, IND., Sept. 6 to Oct. 15.

1AW, 1RK, 2GK, 2JF, 2NF, 2RK, 2XX, 2XJ, 3BZ, 3DH, 3KM, 4BA, 4BG, 4XC, 4YA, 5AO, 5CD, 5CG, 5DA, 5DW, 5ER, 5FV, 5HA, 5IS, 5HA, 5XA, 5YA, 5YH, 5ZA, 5ZC, 5ZF, (5ZL), 5ZK, 5ZZ, 8AM, 8BV, 8CB, 8CF, (8DZ), 8DI, 8DJ, 8DR, 8DV, 8DZ, 8EN, 8ER, 8FT, 8GB, 8GS, 8HA, 8HB, 8HE, 8HG, 8HH, 8HR, 8ID, 8IK, 8JJ, 8JQ, 8KE, 8LA, 8NI, 8UR, 8OJ, 8RI, 8RQ, 8TU, (8TT), 8XK, 8VJ, (8ZA), (8ZD), 8ZV, 8ZW, 8ZG, 8YQ, 8YO 8ACF, 8AFI, (9AP), 9BJ, 9BW, (9DF), 9DV, 9EE, 9EQ, 9FU, 9GA, 9GC, 9GN, 9GS, 9GX, 9HJ, 9HK, 9HM, 9HN, 9JN, 9JT, 9KO, 9KV, 9LC, 9LR, 9MH, 9MR, 9MS, 9MY, 9NQ, 9OE, 9QJ, (9QM), 9QQ, 9RG, 9TT, 9VS, 9WZ, 9XM, 9YC, (9ZC), 9ZJ 9ZL, 9ZN, 9ZQ, 9ZX, 9ZW, 9ZY, 9AAF, 9AAW, 9ABI, 9AJJ, 9AOJ, 9AEG, 9AEP, 9AMV, 9AFB, 9AWI, 9AN, 9AX, NSF, Canadian 3DH.

2JM, NEW YORK CITY, N. Y., Aug. 1 to Sept. 28.

1AJ, 1AK, 1AW, 1AZ, 1BB, 1BBL, 1BM, 1CK, 1DY, 1FAQ, 1FM, 1GY, 1HAA, 1IK, 1JA, 1NAQ, 1NO, 1QP (C.W.), 1RN, 1RZ, 1TS, 1XK (fone and C.W.), 1XD, 1XE, 1LAS, 2TF, (two's too numerous to mention), 3BE, 3BG, 3BS, 3CE, 3CV, 3DH, 3EO, 3FR, 3GX, 3HA, 3HJ, 3KM, 3NB, 3NC, 3OU, 3PM, 3VM, 3WZ, 8BV, 8CB, 8DA, 8DN, 8DV, 8DY, 8DI, 8DR, 8EN, 8ER, 8FO, 8FW, 8IK, 8NI, 8QM, 8SH, 8WY, 8XK, 8XU, 8ZW, 8ZY, 8ACF, 9ALS, 9AU, 9ZJ, 9ZN, NSF.

8AAV, HUBBARD, OHIO, Sept. 20 to Oct. 15.

1AW, 1HA, 1RZ, 2CT, 2BM, 2BB, 2DA, 2JU, 2RK, 2WB, 2ZL, 3BJ, 3BZ, 3FG, 3HJ, 3KM, 3VV, 4CC, 4XC, 5DA, 5ER, 8ADE, (8AEJ), 8AHA, 8BG, 8DC, 8DG, 8DI, 8DR, (8DV), 8EW, 8FD, 8FT, 8GB, 8GI, 8GK, 8HE, 8HG, 8HH, 8HM, 8ID, 8JJ, 8JU, 8MK, 8MT, 8NL, 8SH, 8SP, 8TG, 8TT, 8VK, (8YV), 8WJ, 8WY, 8XX, 8XU, 8ZA, 8ZC, 8ZD, 8ZW, 8KL, 9AA, 9AAF, 9AP, 9AU, 9CU, 9ER, 9FG, 9FN, 9FS, 9FT, 9GX, 9HH, 9HM, 9HR, 9KO, 9LR, 9MK, 9OE, 9RA, 9TT, 9EV, 9ZC, 9ZJ, 9ZN.

By K. GODFREY, WHITE PLAINS, N. Y.

1AK, 1HAA, 1VAA, 2AM, 2BB, 2BG, 2BK, 2BM, 2CT, 2DI, 2DJ, 2DK, 2DN, 2EL, 2GR, 2HJ, 2IR, 2JE, 2JJ, 2JU, 2KV, 2LH, 2OA, 2OM, 2QY, 2RK, 2UA, 2UE, 2VH, 2WG, 2WM, 2XX, 2ZE, 2ZL, 2ZM, 2AAD, 2AAM, 2ADM, 2AEF, 2AGA, 2AHU, 2AID, 2AIH, 2AJQ, 2ANY, 8DR, 8WY, 8XU.

2KF, IRVINGTON, N. J.

1AU, 1AW, 1BL, 1BM, 1CK, 1DQ, 1DY, 1FT, 1FW, 1HAA, 1VB, 1YB, 1XD phone, 2AK, 2BM, 2DN, 2EF, 2FV, 2JJ, 2JL, 2JZ, 2MW, 2OM, 2QR, 2RK, 2TS, 2UR, 2VA, 2WB, 2WR, 2XJ, 2YM, 2ZL, 2ZM, 3BE, 3BH, 3BZ, 3CV, 3DH, 3EN, 3FB, 3FR, 3FN, 3FW, 3GA, 3GX, 3HJ, 3HR, 3HV, 3KM, 3NB, 3ND, 3UC, 3VV, 3ZA, 8ARI, 8CB, 8CF, 8CP, 8DA, 8DH, 8ER, 8FM, 8FR, 8HB, 8HH, 8MT, 8RS, 8SH, 8WY, 8XK, 8XU, 8XV, 8YV, 8ZS, 8ZW, 8ZY, NSF, 9AE, 9LR, 9NQ, 9PW, 9RM, 9VR, 9YP, 9ZJ, 9ZL, 9ZN, 9ZT, 9ZW.

2TS, WEST BRIGHTON, S. I., N. Y.

1AE, 1AW, 1BM, 1CK, 1DY, 1HAA, 1TS, 1ZB, (2ANN), 2DA, (2DN), (2KL), (2QR, fone QSA vy), (2TF), 2XX, 2ZL C.W., 2ZR, 3AW, 3BE, 3BG, 3CV, 3DS, (3DH), 3EN, 3EW, (3FB), 3GX, 3HJ, 3KM, 3NB, 3NV, 3OU, 3PM, 3UC, 3ZA, NSF, 8AG, 8ACU, 8BB, 8BP, 8BV, 8DA, 8EN, 8ER, 8HP, 8JS, 8LF, 8NI, 8PQ, 8WY, 8XU, 9ZN.

6OC, SAN FRANCISCO, to Oct. 14.

6AK, 6AV, 6BQ, 6CT, 6CV, 6DP, 6EA, 6EB, (6EJ), 6ER, 6FE, 6FH, 6FS, 6FT, 6GE, 6HY, 6IF, 6IH, 6II, 6JD, 6JI, 6JM, 6KP, (6OH), 6PQ, 6QR, 6SK, 6TC, 6UM, 6AAK, 6AAT, 6ABG, 6ABT, 7BJ, 7CF, (7CU), 7CW, 7DA, 7ZI.

Heard by L. H. SKINNER at GROOSE ILE, MICH., below Detroit, on crystal and one wire 20 ft. high, July 25 to Sept. 9.

1AW, 3BB, 3BU, 3EH, 8ACN, 8ACV, 8AEA, 8AFL, 8AGF, 8AGJ, 8AGS, 8AII, 8AM, 8AN, 8BQ, 8BD, 8CB, 8CD, 8CF, 8CT, 8DA, 8DI, 8DT, 8DZ, 8EN, 8ER, 8FI, 8GA, 8AB, 8GS, 8GW, 8GY, 8IK, 8IN, 8JJ, 8JU, 8KC, 8LI, 8MC, 8MH, 8MI, 8ML, 8MO, 8MT, 8MY, 8NL, 8NT, 8OB 8OH, 8OZ, 8QJ, 8SH, 8UA, 8UJ, 8VD, 8WA, 8WY, 8XA, 8XD, 8XK, 8XL, 9YV, 8ZN, 8ZW, 8ZX, 8ZY, 9AU, 9AFL, 9FG, 9GX, 9HR, 9ME, 9ZJ, 9ZN.

2CT, BRONX, Sept. 15 to 20th.

(1DQ), 1BL, 1DV, 1XB, (1HAA), (1JAP), (3BZ), 3EE, (3EN), 3DC, (3FG), 3GX, 3HG 3HJ, (3KM), 3IIU, 3ZA, 4CC, 8CB, (8DR), 8EN, 8EQ, 8EV, 8FT, 8GI, 8HG, 8HH 8IK, (8LA), (8LF), 8LD, 8OZ, 8ZD, (8ZW), 8ACF, 8AJW, 9AA, 9AD, 9AT, 9CA, 9HM, (9GN), 9ZL.

2NF, LONG BRANCH, N. J., July 20 to Sept. 8.

(1AK), (1AOL), 1AS, (1AW), (1BM), 1BL, (1CBY), 1CK, 1CM, (1DQ), 1DY, 1FV, (1HAA), (1RZ), 3BG, (3BZ), 3DS, 3EN 3FG, (3GX), (3HG), (3HJ), 3MK, 3OB, (3ZW), (WWV), NSF, 8BG, 8BU, (8BV), (8DA), (8DI), (8DV), (8EN), 8GY, 8HP, (8IK), 8JJ, 8ML, (8MT), (8NI), (8NO), 8OY, (8QM), 8RF, 8RW, (8SH), (8WY), (8XK), 8ZY, (9HR), 9ZN. (Second district statiqns too numerous.)

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QST'S DIRECTORY OF CALLS

ADOPTING the Department of Commerce's list of amateur stations as it standard, QST will publish each month the calls of new stations in each district commencing where the government book stops. To make this possible, amateurs are requested to report new or changed call letters to this office.

FIRST DISTRICT

T. E. Norton	6 Bush St., Newport, R. I.	1EBA
Oscar A. Maynard	131 Massasoit St., Worcester, Mass.	1EBB
Laban Snow, Jr.	Harwichport, Mass.	1EBC
Sewell P. Wright	7 Oak Ave., Peaks Island, Me.	1EBD
G. M. Kaplan	75 Pearl St., Chelsea, Mass.	1EBE
Alfred J. Pote	18 Chestnut St., Chelsea, Mass.	1EBF
John F. Stack	36 Cottage St., Boston, Mass.	1EBG
L. H. Ciaburri	17 Jenney St., New Bedford, Mass.	1EBH
Nicholas R. Pratt	Main St., Hingham, Mass.	1EBI
Ed. F. Surette	Clematis Rd., Medford, Mass.	1EBJ
Douglas E. Dicey	Lyndeboro, N. H.	1EBK
Jos. A. Stevens	17 Ash St., Bar Harbor, Me.	1EBL
B. W. Bates	North Harwich, Mass.	1EBM
Worcester North Radio Ass'n	800 Water St., Fitchburg, Mass.	1EBN
John D. Babb	Elm St., Machias, Me.	1EBO
W. E. Courtois	125 Fourth St., Leominster, Mass.	1EBP
T. F. Kane	Front St., Marion, Mass.	1EBQ
Oscar S. Lucier	49 Hancock St., Salem, Mass.	1EBR
Wm. Bibby	15 Edison St., New Bedford, Mass.	1EBS
G. B. Davy	Main St., Hingham, Mass.	1EBT
L. S. Williams	13 Cherry St., Salem, Mass.	1EBU
Winthrop Crawford	60 Revere St., Bridgeport, Conn.	1EBV
R. J. Reid	302 Essex St., Salem, Mass.	1EBW
George T. Cheetham	42 Eighteenth St., Lowell, Mass.	1EBX
A. R. Rogowski	128 Prospect Ave., Shelton, Conn.	1EBY
Robert W. Lynch	148 Willow St., Lawrence, Mass.	1EBZ
Leslie M. Taylor	3 Riddell St., Greenfield, Mass.	1FBA
Elmer C. Hopfner	21 South Woodbine St., Hartford, Conn.	1FBB
Chas. H. Burnham	90 Court St., Machias, Me.	1FBC
Earl B. Ely	337 Windsor Ave., Hartford, Conn.	1FBD
David R. Dunigan	31 Tonawanda St., Dorchester, Mass.	1FBE
Levi G. Cushing	South Duxbury, Mass.	1FBF
Minton Cronkhite	North St., Greenwich, Conn.	1FBG
William L. Krause	6 Division St., Stamford, Conn.	1FBH
Frederick F. Spalding	Wilton, N. H.	1FBI
Albert Thebergo	228 Hampshire St., Lawrence, Mass.	1FBJ
Richard C. Barrett	195 Summer St., Bristol, Conn.	1FBK
Reginal R. Stebbins	46 Gilsum Rd., Keene, N. H.	1FBL
Raymond A. Colvin	33 St. Botolph St., Boston, Mass.	1FBM
Edward Gosselin	1073 South Water St., New Bedford, Mass.	1FBN
Phillips E. Strout	42 Garvan St., East Hartford, Conn.	1FBO
Arthur A. Bellavance	812 South First St., New Bedford, Mass.	1FBP
Rodney A. Merrill	31 Hayward St., Attleboro, Mass.	1FBQ
Fletcher King	1 Beach Rd., Gloucester, Mass.	1FBR
Frederick Buck, Jr.	Ft. Constitution, Portsmouth, N. H.	1FBS
Arthur L. Cummings	56 Pierce Ave., Houlton, Me.	1FBT
Harry F. Holland	100 Danforth St., Taunton, Mass.	1FBU
Fred A. Ficus	Quissett Ave., Woods Hole, Mass.	1FBV
Leon E. Randall	72 Beaver St., Keene, N. H.	1FBW
Edward N. Dingley	1151 Washington Ave., South Braintree, Mass.	1FBX
John F. Williams	113 Leighton St., Bangor, Me.	1FBY
George L. Langreth	18 Garvan St., East Hartford, Conn.	1FBZ
International Radio Tel. Co.	Rockland, Me.	1XQ
International Radio Tel. Co.	Belfast, Me.	1XR
C. D. Tuska Co.	Hartford, Conn.	1XV
Mass. Radio & Telegraph School	Boston, Mass.	1YS

THIRD DISTRICT

Pennsylvania-Marconi Wireless	School, Philadelphia, Pa.	3YF
Pohn V. Pursell	Bethesda, Md.	3ZF
Roy C. Corderman	Hagerstown, Md.	3ZI
Chas. H. Stewart	St. David's, Pa.	3ZS

FOURTH DISTRICT

B. W. Benning	50 Whitford Ave., Atlanta, Ga., (Ex. 4BZ)	4XC
F. M. Laxton	Mecklenburg, N. C. (near Charlotte)	4XD

FIFTH DISTRICT

Wm. C. Finlay	Troy, Ala.	5IA
Knights of Columbus	New Orleans, La.	5YJ
Edgar A. Sahm	New Braunfels, Tex.	5YK
Frank B. Beuhler	Alexandria, La.	5ZD
Henry M. Harris	Box 427, Waco, Tex.	5ZF

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SIXTH DISTRICT

P. F. Johnson	2940 Maiden Lane, Altadena, Cal.	6ABA
Edw. Prosek	1085 Church St., San Francisco	6ABB
A. K. Aster	910 Chestnut St., Alameda, Cal.	6ABC
R. C. Thom	2625 53d St., Los Angeles, Cal.	6ABD
W. R. Dodson	924 A Ave., National City, Cal.	6ABE
C. S. Smith	3512 Parl Blvd., Oakland, Cal.	6ABF
J. E. Hopkinson	309 S. Flower St., Los Angeles, Cal.	6ABG
G. K. Spencer	1324 Weber St., Alameda, Cal.	6ABH
C. E. Cosgrove	716 E 22nd St., Oakland, Cal.	6ABI
E. R. Sharpe	Martinez, Cal.	6ABJ
G. Fensky	689 62nd St., Oakland, Cal.	6ABK
E. C. Reynolds	Paso Robles, Cal.	6ABL
S. March	98 Wilkes Circle, Santa Cruz, Cal.	6ABM
R. C. Saunders	1528 Cambria St., Los Angeles, Cal.	6ABN
E. E. Smith	537 N. Greenleaf Ave., Whittier, Cal.	6ABO
R. C. Anderson	1919 Lime Ave., Long Beach, Cal.	6ABP
C. Schneider	76 Caselli Ave., San Francisco, Cal.	6ABQ
S. Inselman	57 Douglas St., San Francisco, Cal.	6ABR
N. Ashima	1474 Nuuanu St., Honolulu T.H.	6ABS
J. D. Shea	5158 Birch St., Oakland, Cal.	6ABT
A. Stokes	2812 35th Ave., Oakland, Cal.	6ABU
E. J. Conroy	3850 Penniman Ave., Oakland, Cal.	6ABV
W. B. Donnewith	1235 Weber St., Sacramento, Cal.	6ABW
W. Huston	Woodland, Cal.	6ABX
G. S. Clark	127 N. H. St., Imperial, Cal.	6ABY
F. S. Hannah	Puente, Cal.	6ABZ

SEVENTH DISTRICT

E. L. Crawford	1340 Court St., Salem, Ore.	7JA
Fred H. Stephens	822 Halsey St., Portland, Ore.	7JB
Keith Frazier	829 3rd Ave., Glascow, Mont.	7JC
Francis McKee	Cambridge, Ida.	7JD
H. C. Boardman	112 West 5th St., Port Angeles, Wash.	7JE
Clude Anderson	5095 Washington St., Moscow, Idaho	7JF
H. R. Drinker	497 East 16th St. N., Portland, Ore.	7JG
J. D. Hertz	Route 3, Vancouver, Wash.	7JH
Albert McGuffin	346 First Ave. N., Glascow, Mont.	7JI
Douglas Dix	Box 151, Gresham, Ore.	7JJ
Frank P. Bloss	792 East 34th St., Portland, Ore.	7JK
Waverly Miller	1704 East 14th Ave., Spokane, Wash.	7JL
O. R. Anderson	1114 East Market St., Portland, Ore.	7JM
Roy Rice	Wapanitia, Ore.	7JN
B. A. McMahon	5137 Willow St., Seattle, Wash.	7JO
P. W. Dann	Box 974, Astoria, Ore.	7JP
Theo. E. Olson	528 Market St., Portland, Ore.	7KR

EIGHTH DISTRICT

(Following reissued calls; cancel assignments in Call Book.)

A. F. Krause & Co.	689 McDougall Ave., Detroit, Mich.	8CB
Harry J. Walsh	566 Beniteau Ave., Detroit, Mich.	8DX
Louis A. Weston	309 Lincoln Ave., Detroit, Mich.	8ER
Howard Bowman	431 Ashland Ave., Detroit, Mich.	8HH
Harry Terry	601 Pasedena Ave., Detroit, Mich.	8LN
Alfred M. Martin	1327 Vermont Ave., Detroit, Mich.	8PM
Charles F. Hayek	3044 W. 44th St., Cleveland, Ohio	8PY
R. L. Osborne	547 McClellan Ave., Detroit, Mich.	8QY
R. M. Smith	139 McGraw Ave., Detroit, Mich.	8AFL
Robert Austin	38 Sterling Ave., Detroit, Mich.	8AHO

(Following are new calls.)

Walter Holey	R. D. No. 3, Norwich, N. Y.	8AJA
Herbert M. Walleze	234 Vine St., Milton, Pa.	8AJB
Sherman R. Hawley	409 Prescott St., Toledo, Ohio	8AJC
Frank E. Holcomb	30 Burns St., Wyoming, Ohio	8AJD
Norman J. Bukey	430 S. Sandusky St., Delaware, Ohio	8AJE
A. C. Penfield	Conneautville, Ohio	8AJF
C. H. Kreighbaum	1256 E. 125th St., Cleveland, Ohio	8AJG
Warren Walker	Box 113, Marlette, Mich.	8AJH
Vern Harry Vance	R. R. No. 1 c/o Mrs. H. J. Britt, Bedford, Ohio	8AJI
Owen C. Thompson	3252 Kimball Ave., Toledo, Ohio	8AJJ
James A. Ulmer	208 S. Walnut St., Bucyrus, Ohio	8AJK
John D. Marsh	562 Mentor Ave., Painesville, Ohio	8AJL
Wilcox Laboratories	131 S. Fairview St., Lansing, Mich.	8XS
Cass Tech. High School	Detroit, Mich.	8YE
H. K. Dunn	Miami Univ., Oxford, Ohio	8YR
Chas. Candler	105 S. Ash St., St. Marys, Ohio	8ZL
Roy C. Ehrhardt	Dunmore, Pa.	8ZQ
C. C. Endley	Mansfield, Ohio	8ZR
Clyde E. Darr	137 Hill Ave., Highland Park, Detroit, Mich.	8ZZ

NINTH DISTRICT

Tilden Tech. High School	Chicago, Ill.	9YE
Evanston High School	Evanston, Ill.	9YH
St. Louis University	St. Louis, Mo.	9YK
Armour Inst. of Technology	Chicago, Ill.	9YL
Culver Military Academy	Culver, Ind.	9YQ

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HONEYCOMB COILS

Providence, R. I.

Editor, QST:

Since honeycomb coils have been on the market some little time and have not suffered for want of advertising it seems safe to assume that at least some amateurs have tried them out, yet few amateurs have contributed any information on them based on personal experience. True, we have Mr. Groves' very interesting articles, but how many amateurs attain his skill or obtain such fortunate results? To hear Europe and Hawaii on "even the smallest aerial" and to copy Europe with no aerial at all and with only one bulb—well, if the chap next door dropped in and said he had just done it we all know what we'd say; but of course Mr. Groves is not the dub next door. So upon reading Mr. Groves' article and having at hand some honeycomb coils and feeling at least mildly excited at an opportunity of hearing POZ, not to mention that little near-by island of Hawaii, with any old aerial and possibly with none, we proceeded to follow directions by setting the secondary condenser and "tuning the primary coil", etc. We did so with no little trepidation since the "click" so necessary to locate may sometimes "be likened to lightning striking a phone wire at a little distance while you are talking" and although we could only imagine how lightning would sound under such circumstances we had no hankering to make the "dream come true". So we prepared to duck, dodge, jump and call the ear doctor if that click materialized as described. Well, we turned that primary condenser around and by and by heard a slight noise and looked around to see who could have dropped a pin, but seeing no one nor any pin, we finally concluded it must have been the celebrated click of which we were in search. Patient adjustment and change of coils eventually made the click an actual one, but it never reached the lightning stage nor ever promised to. Probably that is why we didn't hear all those European stations, let alone copy any of them. If we were only a Rockefeller or Morganbilt or even a little war-time profiteer we might import some one of Mr. Groves talent to tune our honeycombs for us, but our ambition being bigger than our pocketbook we could only think of writing the makers of the coils requesting an exchange for a set like Mr. Groves. However, diligent search of their catalog revealed no claim that honeycomb coils would land European stations without any aerial, so we hesitated to put it up to them. And so we are right back where we started from which is pretty discouraging, especially as we shall doubtless read in the next QST that Mr. Groves has copied Mars and all on a single VT.

So by way of consolation we hope some one of less talent than Mr. Groves and whose grey matter is a trifle less grey will tell us what he has accomplished with honeycombs and how he did it—some one whose ears still feel the need of an aerial, however insignificant.

Meanwhile we venture to outline briefly our own limited experience with these coils and to mention a few troubles encountered en route. First as to the coils themselves. We soon found that there was a lack of uniformity in size both as to plugs and sockets so that one coil would slip on hard and another too easy, and although some margin of difference is doubtless necessary where anything is manufactured in quantities we think the margin allowed in the present case over-large, especially in the case of the sockets, since if a plug is spread or split enough to fit a large socket it is often impossible to slip another coil on to the mounting at all. However, the majority of coils were fortunately not so bad and could be interchanged without much difficulty. The next thing we noticed was that the straps about the coils which held them to the mounting plug often became loose and in some cases needed frequent attention and tightening. This was more or less of a bother.

However, these were minor troubles to what developed during the "dog-days" when heat and humidity raced for the championship. We first noticed that the coils were covered with beads of moisture, especially on the straps, and attempting to wipe these off we found the moisture to be somewhat sticky, so that all the coils had to be gone over carefully ere they could be used with any comfort. On a succeeding day we found the moisture collected again, but in such quantities as to have dripped from the coils upon the

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apparatus beneath. So we cleaned up again and put the coils away, temporarily awaiting better weather. Upon digging them out again they had to be cleaned anew. Incidentally what effect such a collection of moisture had upon the capacity we won't venture to say. However, we are still using this type of inductance since it possesses certain manifest advantages in the way of compactness, etc., especially for long waves, and we do not wish to detract from its merits in the least.

Second as to circuits. Being more of a novice than an amateur we hesitate to say much regarding circuits and results, lest we betray our novitiate too badly. But as "he who hesitaties is lost" we push on. After suffering the usual vicissitudes of fortune (perhaps more truthfully the calamities of ignorance, to which any novice is heir), we at length, with the aid of a more experienced friend, tried out the single coil damped and undamped circuit as shown by the makers of the coils, also the three coil tickler circuit, and the tuned plate circuit as we understand it. With the first circuit good results were had with undamped waves but the spark stations were disappointing. The three coil tickler circuit gave good results on long waves but we fancy was not particularly efficient on anything less than "time" or NAA. We also found that the short waves required a proportionally larger tickler coil than the undamped and that the condition and adjustment of the "B" battery was also more vital. A 750 coil would "tickle" with 1500 in the secondary but 75 would not always work well with 100, and with 50 in the secondary we had to put 75 in the tickler. All in all we are inclined to think that for spark signals the old loose coupler is hard to beat, although no doubt within their limited range the Paragon and Grebe sets are the thing. In the not too distant future we hope to try out Mr. Groves single layer coils for short waves and although we have met but with scant or indifferent success using the tuned plate circuit it will doubtless be our own fault if we do not secure better results with his coils.

As for working without an aerial, etc., we have heard WSO, only about 35 miles away, without aerial or ground or any primary coil at all, and even without opening a window as a layman suggested. But it wasn't loud enough to frighten us or encourage the belief that we could hear much else with a like handicap. Adding ground connection and primary coil but no aerial, increased the signal strength appreciably.

Incidentally we think one of the chief advantages of the honeycomb and like inductances is the relative cheapness for the great range covered. We might almost say that all wave lengths can be covered for a sum that most of us can "beg, borrow or steal", as the saying goes and as our professional instinct may best prompt.

Yours truly,
A. Novice.

CAN ANYONE HELP?

Scranton, Pennsylvania,
802 Woodlawn St.

Dear Mr. Warner:

During the last few meetings of the Electric City Radio Club, several of the members, in fact nearly all of them, have reported a very bad interference on wave lengths of from 200 to 600 meters. It is a harsh rasping noise sounding somewhat like a cross between a quenched gap that doesn't quench and a high tension leak. It started about three weeks ago and sounded about like a spark with a frequency of 325 per minute. It has since grown more steady and much worse.

Mr. Dawson, one of the men higher up in the Scranton Electric Company, has cooperated with us in trying to find it, but we have made no progress as yet.

At our club meeting last night, it was reported that the same condition was in existence at Wilkes Barre, a town about 20 miles away. The interference quite effectually stops signals on amateur wave lengths, except in the very few stations that don't get it. If it is atmospherics, why should it have such a definite range of wave lengths, yet if it is not, why does it cover so much territory?

Possibly you have had a similar interference or have heard of it, and anything you can tell us about getting around it will be greatly appreciated. Also, do other parts of the country have this same trouble at this time?

Thanking you for past favors, and hoping you can throw some light on our trouble, I am

Yours very truly,
P. D. McFarland.

DESCRIPTION OF A C.W. SET

116 Polk St., Napa, Cal.

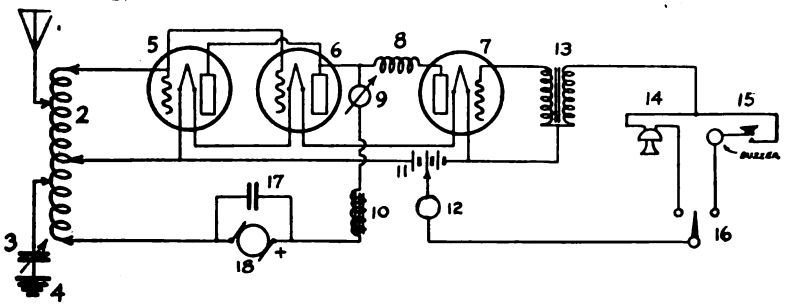
Editor, QST—

I have followed the C.W. Articles in your magazine for the past few months with a great deal of interest and consider your magazine as a whole of such high standard among radio magazines that I have already sent in my subscription.

I have been experimenting with CW during the past three months and have reduced my set to one of extreme simplicity and efficiency. Using two 5-watt tubes in parallel and radiating 1.2 amps, I have several times worked 7ZI, 7CU and 6JD,

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all three between 500 and 600 miles distant. All stations receive me with very good audibility and without the usual repeats experienced with spark transmission. Also fading is unknown. This work has been done with an antenna of three wires spaced 4 ft. apart with an overall length of 90 ft. and 35 ft. high. I am a firm believer in the future of CW on 200 meters, the great drawback being the difficulty experienced in calling, due to the extreme sharpness of the emitted wave and the unwillingness on the part of the average amateur to use an oscillating audion.



To use the above set with buzzer or voice modulation, a third modulator tube and transformer are used. There follows below a diagram of my circuits, together with specifications for the various pieces of apparatus.

1—Antenna, 35 ft. high, 3 wires spaced 4 ft., 90 ft. long
2—Inductance, total of 40 turns, 6 in. diam., spaced ¼ in. apart, bare No. 12 copper wire
3—Variable condenser, approx. .0015 mfd.
4—Ground
5-6—5 watt power tubes, plates and grids in parallel
7—Modulator tube, 5 watt.
8—Air-core choke, 500 turns No. 28 wire
9—Milliammeter, 0-150
10—Iron core choke, 1200 turns No. 24 wire
11—24-volt storage battery, tapped for 6 volts for transmitter and buzzer
12—10-ohm rheostat
13—Modulation transformer
14-15—Telephone transmitter, buzzer and key
16—S.P.D.T. Switch
17—2-mfd. condenser
18—300-volt generator

In tuning the above set the antenna and ground must be connected at all times, as these form the oscillating circuit. The number of turns between the antenna and ground clips will vary according to the natural wave length of antenna but should be adjusted so as to include turns in both grid and plate circuits. For 200 meters approximately 3 turns in grid coil and 5 turns in plate coil are used.

In closing I wish to state that I am not located in San Diego as shown in the call book, but at Napa, Cal. This is for the benefit of those who have heard me and who sent cards to San Diego instead of to the correct address.

Yours very truly,
J. J. Mahler, Jr.

(Editor's Note—This is an interesting set but we wish to point out a probable improvement. It is not possible to properly modulate the output of two tubes by the use of one similar tube as a modulator. The principle of this system (known as the Heising constant-current method) is that when the microphone is idle, there shall be an even distribution of power between oscillator and modulator. This will obviously require an additional modulator. In practice, however, losses in the modulator are so much greater than in the oscillator that often we see sets with three modulators to modulate the output of two oscillators. The modulated range of this set would doubtless be increased thru the addition of another modulator in parallel to the one now used.)

THE LEGAL DEPARTMENT

Milwaukee, Wisconsin.

Editor, QST—

In reference to a communication by Mr. W. H. Kirwan, in the November QST, proposing a legal department assisting QST and its advertisers in patent matters, it may be profitable to consider a solution of the problem arrived at in a large American industry, where a condition prevailed at one time similar to that existing now among manufacturers of radio apparatus, which, as Mr. Kirwan intimates, is resulting most unfavorably to purchasing amateurs.

A number of manufacturers organized an association employing co-operative patent counsel who render service as suggested by Mr. Kirwan. A patentee charging infringement or demanding royalty of a member of this association is referred to the association counsel who

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investigate the merits of his claims. If favorable a license is arranged which is extended to all members of the association who feel warranted in accepting it. A low royalty is quite acceptable to the patentee because of the large number of licensees. (The royalty is so low, in fact, that some members accept the license without any investigation as to infringement).

If the patentee is thought not entitled to make any demands the manufacturer is reliably informed of the fact and continues operations without fear of interruption.

Patents held by members are automatically licensed to all other members. This provision precludes any possibility of litigation between members. It would seem that this would operate to discourage individual effort in filing patent applications, but is not so among broadminded manufacturers, as evinced by numerous patents granted to them.

Complete files of all copies of patents which would be likely to interest the art are maintained and kept up-to-date, also literature relating to the art.

These facts are submitted as exemplifying methods employed in another art with good results. Though all the provisions indicated here may not be applicable to the present situation in the radio art, it is thought that they will offer suggestions to manufacturers.

Respectfully,
C. L. Waal.

QUICK, GESCHNELL— THE RETTYSNITCH!

Dere Eddy:

Here ban a gude one I tink. Copla nites ago Im heerin OM 9ZL open up an giv msg for Duluth to 9ZC who ban 150 mebby 200 mile farder beyon odder side way up on top of Minn. Den I place my ear close to ze brightly burning lanterns and listen intent for "BQ" who will get a liscence when he is sure he can copy ten words. All of a suddeness ze plate slips on its charcoalistic curve and spill over and make ze grid leak an ze bottle flicker like so many Aroaring Borneos in ze sky. By gar I ban Bumfozzeled. Den ze bright idee strike me. With my hanker, queek as flash, I wipe up ze damped waves that spilled over and proceed to read ze sigs by ze flickerings of ze lamp. I make out that 9JN alias Stenerson way down in Iowa is warking fren "BQ". Den by gar Im tink ZC get mad cause he dont hear BQ so he flip coin to see which foot he shall send with sos to call Stene. JN tell ZC "GA OM AYE TANK AYE QSR FOR U QSO BQ QRK QSA QRM QRN BUT QRK QRS QSZ QRV GA (etc) KKKK." Here come ze gude part OM. Stene takes msg an cant raise BQ again so vat u tink he gives ze msg to 9ZL to QSR. Ouch!

Sa what ze traffic regulations say about ze number of times a station can take ze same msg? Some fine day I read on cover of QST, "9ZL HANDLES 6294 MSGS!" which is all bunk. Well Eddy, Im tink I taik lots time now but I like to ask your Traffic Menagerie about dis har law.

Yourn,
R. E. Peat, Radio QTA.

BAD AMPLIFYING TRANSFORMERS

Room 1320 Republic Bldg.,
Chicago, Ill.
Nov. 12, 1920.

Editor, QST—

In regard your article under "Strays" on page 45 of Nov. QST about amplifying transformers going dead. Tell the boys in Houston that it is a factory fault and not theirs. It is due to the using of an acid flux in soldering the leads of the coils of the transformers. There has been considerable trouble in this respect. I personally had two go dead on me. I returned them to the factory who made good.

They evidently got a bad lot down that way.

Trust this will help them out.

Sincerely,
Robt. J. Ritchie, 9ARN.

APPROPRIATION NEEDED

New Orleans, La.,
Nov. 12-20.

Editor, QST—

Mr. E. T. Jones' suggestion in November QST for a female "Radio Stenographer" is an excellent one, and no one who has not seen Mr. Jones trying to dictate a radio letter to some fair, gum-chewing damsel will ever know what prompted said E. T. J. to make his thoughts public. But talking from a purely selfish amateur standpoint, do we not need more assistant radio inspectors at present than radio stenographers? Would not QRM and unlicensed "hamming" be reduced with proper radio inspection?

The reason we have not proper inspection is the same reason why E. T. J. cannot get a female helper versed in radio, and every inspector in the country will tell you that it is, "No appropriation from the government". It seems as tho it must take a special act of Congress, or an amendment to the Constitution, to get help for the radio inspectors. The inspectors themselves very often have to get help (of another kind) in order to live, thru interesting themselves in some radio school,—and still the letters continue to roll into Washington, saying, "SOS, immediately, or this district goes to pieces", and surer than an echo, the answer comes back from those in the Capitol City,

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"There are no appropriations". Ye Gods! where is the Old Man, and his "Wouff Hong".

Sincerely,
H. P. Roberts.

(It is a sad fact that the appropriation for the Radio Service of the Bureau of Navigation has in the past been cut to a figure where their activity has had to be curtailed to a minimum. If any of our readers have friends on the Appropriation Committee they could do Amateur Radio a good turn by urging that the Radio Service be given sufficient funds to carry on its work efficiently.—Editor.)

THE PRICE OF EQUIPMENT

Brooklyn, New York,
November 16th, 1920.

Editor, QST—

The A.R.R.L. being an organization of, by and for the amateurs, does it not behoove us to protest collectively against the high, and generally increasing prices of raw materials and completed apparatus? It can be readily ascertained that the number of radio concerns making upwards of 300% is legion. Where do we, upon whom they depend for their market, get off? When one considers that even paying retail prices for raw materials, and allowing liberal compensation for time, instruments may be constructed about one quarter of the usual market price, it looks as though something is wrong. A large number of one-horse concerns, offering mediocre apparatus, are making money hand over fist. How do they do it? Not by quantity production nor quality apparatus, but, seemingly, by concerted gypping.

Drastic price reductions have been made in a good many other lines and it is about time the radio people followed suit. Slackening public demand was the prime factor in lowering prices—prices tumbled because the public did not buy. If we withhold our purchases for a time, radio prices should drop to a reasonable figure and the mushroom profiteers would drop out, leaving the field to the reliable manufacturers who deserve our support.

Would like to see expressions of opinion from both buyers and sellers.

Yours,
Albert R. Heydon,
Fred C. W. Thiede.

CALLS HEARD AT SEA

S. S. Lake Forsby,
Houston, Texas, Nov. 16th.

Editor, QST—

Just was reading Mr. Braidwood's letter in the November QST concerning commercial operators listening down on short waves, and it has reminded me of the fact that last trip I have been copying some amateurs on short waves after PX.

Going from Phila. to Houston, Texas, the station which showed up the best was 2RK, he being QSA every night until 100 miles east of Galveston. 3DH was copied down as far as Key West, and at that time he was chewing the rag with 2RK about the election. NSF telephone was heard when in the Gulf, working 5YH, but he faded very badly. The receiving set consisted of short wave Navy tuner type SE-143 and two step amplifier. I think I could hear 2RK over in England if I had my Paragon along with me, as this Navy tuner is not very efficient on short waves.

Below is a list of stations copied between Oct. 30th and Nov. 8th, from Hatteras to Galveston Bar.

1AW, 1HAA, 2JZ, 2RK, 2AAV, 2EL, 2ZL, 2AJW, 3GO, 3BZ, 3VV, 3HJ, 3OB, 3HX, 3UQ, 3LG, 3AS, 3BA, 3PM, 3DH, 3SX, 3HG, 3EH, 4DW, 4YB, 4BY, 4AG, 4BQ, 4XC, 5AO, 5ZC, 5CD, 5HA, 5ZW, 5YH, 5ZP, 5ZZ, 5ZL, 5DA, 5XA, 6ZN, 8ER, 8ZY, 8ZX, 8DJ, 8AY, 8CB, 8NI, 8ACF (QSA 220 miles south NAT), 8ZD, 8JU, 8SH, 8XK, 8QM, 8QJ, 8ZL, 8HT, 8MT, 9GN, 9LR, 9ACN, 9AIQ, 9UU, 9AEG, 9AEY, 9BW, 9ZJ, 9HM, 9EL, 9ZV, 9VA, 9QJ, 9RU, 9ZL, 9OE, 9KV, 9AAC, 9CQ.

Anybody hearing the signals of 3EV, will they please let me know. I only work 3EV when home in Phila. and would be thankful if anybody over 500 miles would drop me a postal.

Sincerely,
M. H. Mandelkern, (3EV)

2RK PARTNERSHIP

Brooklyn, N. Y.,
Nov. 13th, 1920.

Editor, QST—

We beg to announce in your next issue of QST that stations 2RK and 2RV have been combined. The station call will be 2RK.

Mr. J. K. Hewitt and myself will operate the station. Arrangements are being made to find another good man, so a continuous watch may be kept. Our signs will be "KH" and "RV", respectively.

Yours truly,
James V. Candido.

A SUGGESTION ON QRM.

531 River St.,
Hoboken, N. J.

Editor, QST—

In New York recently the representatives of several Radio Amateur Clubs met to discuss elimination of interference in the Radio Amateur field. Many plans were discussed. The point of all of them was the arrangement of a schedule to regulate traffic to local distance points. There are many things to recommend this plan. The principal drawback, however, is that a complete organization is required to perfect the system.

(Continued on page 64)

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FOR CHRISTMAS

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AND OUR 55 PAGE CATALOG

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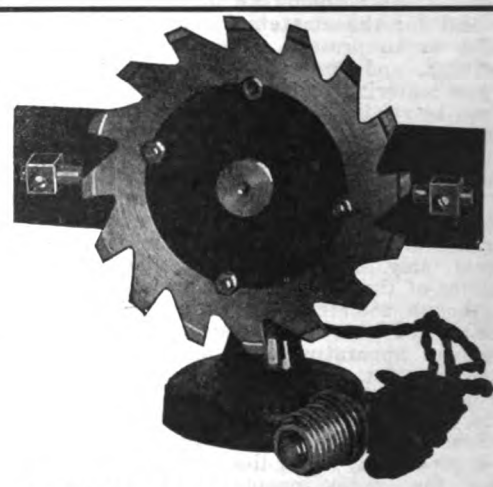
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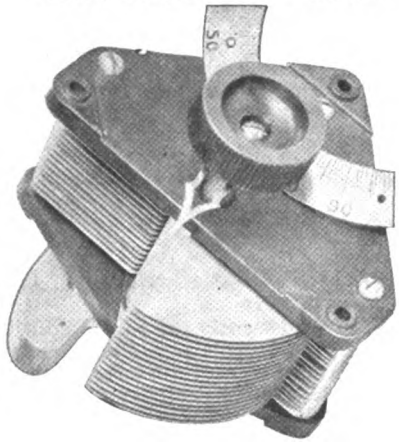
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CAT. NO. YM-10

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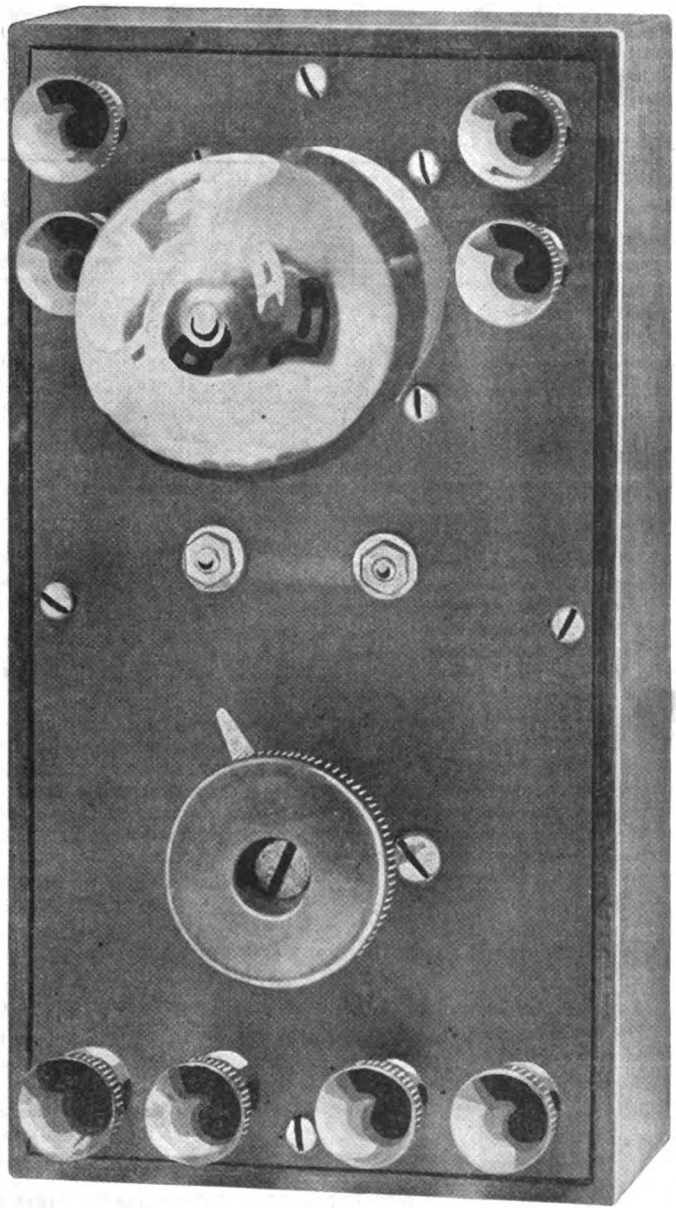
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Actual Size



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In the commercial field the same difficulty with interference is encountered to a far greater degree. At various times commercial companies have tried to arrange schedules by which interference would be eliminated. These schedules have met with varying degrees of success. At the present time a different method is being tried out. The new plan is taken from the Naval procedure.

The idea is based on a change of wave length. A designated wave is fixed on which all calling shall be done. Other wave lengths are arranged so that once having established communication, it is a simple matter to shift to a wave length on which there is no interference. Most of the transatlantic vessels are now equipped with 400, 600, 800, and 1800 meter waves for spark transmission and with 3000 meters for undamped work.

The amateur is limited to 200 meters. During the war the Navy used a wave of 52 meters for short distance work. Amateurs whose power did not exceed ¼ K.W. could use 100 meters or less without a very appreciable decrease in range. They would then be free from jamming by higher powered amateur stations.

Each higher powered station should be carefully tuned to a slightly different wave under 200. It would not be difficult to have these waves published in the call books.

Under these circumstances a common calling wave would not be necessary. Shifting of sending waves requires a mechanically complicated hook-up. An amateur who did not know the exact wave of a station with whom he desired to work could easily arrange a "stand by" hook-up.

There are many minor points of this plan that would require adjustment. A special case could be arranged to care for C.W. apparatus. The help of government inspectors would be needed to regulate the wave lengths. They have already volunteered their aid to the representatives who met in New York. Wave meters would become an important part of every amateur's equipment.

But, on the whole, clear air would more than compensate for the work required to change to the new system.

F. B. Llewellyn.

RECTIFIERS FOR C.W.

2637 Garfield N.W.,
Washington, D. C.

Editor, QST—

In regard to Mr. A. K. Ransom's note "D.C. for C.W. Tubes" on poge 49 of November QST.

I would like to call attention to the fact that an X-ray machine with synchronous disc rectifier usually jams nearby radio stations unmercifully, quite regardless of wave length, and in spite of the fact that there is no definite radiating system.

It is reasonable to suppose that part of the surges causing these effects could be eliminated by using contact brushes rather than spark points.

At best, however, the output of the disc is not D.C., but pulsating, and if used as delivered by the disc it will cause the note to be a heavy 60 cycle growl. Should true C.W. or voice or buzzer modulated transmission be desired, it will be necessary to design a smoothing-out system to operate at high voltage, tho having sufficiently large values of inductance and capacity to filter out a strong 60 cycle component. Such a filter is expensive. The system has promise, however.

Another suggestion. The small transformer-rectifier systems now for sale are of too limited power to be of much interest to most of us. Larger sets of the same type may be made if Kenotron (General Electric high voltage rectifier) tubes are used or if tubes just like those to be driven are used. In the second case the grids of the power tubes used as rectifiers are connected to the plates to prevent blocking by a "dead" grid. The transformer requires two secondary sections, each with about double the voltage required at the power tube since about half the drop is thru the rectifier tubes. Obviously this is an emergency device of low efficiency.

S. Kruse.

EDITORIALS

(Concluded from page 32)

ation, affiliated with the League, and this society is doing good work in untangling the situation. In Philadelphia we have the P.A.R.A., a strong and hustling organization, and we are sure that the report from the Bureau that unlicensed QRM resulted in an absolute zero score for their city in the October tests will awaken them to action which will clear up this blot on their 'scutcheon.

We suggest the appointment by each club of a strong Investigation Committee, charged with the duty of digging out these offenders. Wouff-Hong tactics should not be used at first, as without doubt many of these men do not know that they are violating a Federal law, and a spirit of friendly co-operation and assistance in enlightening them and helping them to secure licenses will result in more good stations, more members for the clubs, and the conversion of a dangerous situation into a local organization of which any club may be proud.

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THE OPERATING DEPARTMENT
(Continued from page 42)

r a license and will use a 1 K.W. set on)0 meters. He reports: "Things are be-nning to liven up in this part of the ivision in the last month. The following ations have been heard here and should ake good relay stations: 9AEG, 9BW, LR, 9WU, 7EG, 7IM, 7CC, and 6OH; all them very QSA.

"Mr. E. L. Wharton, 7EX, at Glasgow, as been appointed District Superintend-nt for Nortern Montana. (According to letter received, 7EX should be heard on ound 300 meters)."

Mr. F. F. Gray, 7FL, President of the utte Radio Club, and District Superin-endent for that locality is now on the job ith a 1 K.W. Thordarson set, and will be n shortly with a 50 watt radio telephone nd C.W. set.

Mr. Slauson, 7ZG, Bear Creak, has just ompleted rebuilding his new station.

Stanley, 7DJ, at Helena, is in a bad fix. Ie reports that the only stations outside f Helena that they have worked are at reat Falls. And that as far as they now, no stations have ever heard 7DJ or ny other Helena stations with the excep-ion of Great Falls stations, and once 7ZB. Sure in a tough "hole". D.M.)

Idaho

Jack Woodworth, 7CC, is doing excellent vork at Moscow in keeping the Northern oute open almost unaided at the present ime. His spark roars in both east and vest. He says: "Development along trunk ine "A" is not progressing as rapidly as ould be expected, notwithstanding the act that all messages have been going hru regularly. All east-bound messages andled by 7CC have been given direct to tations in the ninth district, and the najority of those to 9WU, at Ellendale, N. Dak. The distance is about 850 miles ver some of the roughest country in the United States. While 9WU's signals have been copied here regularly QSA, the need of an intermediate station is easily appar-ent, for it will be an impossibility to clear 9WU every night. 7IM has not been heard here for several weeks.

"Boise has come to life. Two stations, 7YA, and 7GY have been worked QSA."

C. N. Teed, 7FT, Dist. Supt. for Southern Idaho reports there is good prospect of four relay stations in southern Idaho: 7YA, 7GY, 7FT, and the station of the Martin Bros. at Nampa. 7GY is using ¾ K.W., and the rest 1 K.W. During the past month receiving conditions have greatly improved.

Washington

Mason at Seattle reports that, "If it wasn't for 7AD, we would be off of the map entirely. There is a lot of small town stuff going on here, and as it is easier to do than to work long distance, the majority of the fellows prefer the former.

"Very little relay traffic is being handled in or out of Seattle at present. As the situation now stands, 7AD is the only station here handling A.R.R.L. traffic. The route to Portland via 7YS does not seem to be working at it should. We would like to suggest here that some one try and persuade 7YS to come down to 200 meters for a calling wave, then shift to 375 meters for working, similar to the way 6ZK does. This would be a great help in working thru QRM, and still we would know when we are being called without having to listen on 375 meters. 7DA, 7ZI, and especially 7BP are all good here, but 7AD has trouble working them. 7IN comes roaring in, and takes traffic without trouble.

"7FV and 7FO, both of Everett, can be heard working six stations, but their signals seem to carry over our heads for they are always QRZ. No one else north of Seattle has been heard here during the past month.

"Quite a bit of local work is being done, and 7AS and 7IU, both of Seattle have succeeded in working 6FE. 7AD has put business thru to six stations quite regularly, and in this connection 6EJ should be recommended for his good receiving."

Miss 7CB, of Tacoma, reports: "7CE is doing all within his power to put Tacoma, and in fact the whole Northwest on the map. He says, 'we'll show those eastern 'birds' what we can do'. Messages may now be transmitted east from here in almost Western Union time and reliability.

"We are glad to hear the old familiar fist of 7CC again.

"At 7YS business has been picking up wonderfully. He reports having heard 9OE and 9LR, also having heard by both of these stations. 7YS has been assisting in conducting tests with the radio-phone stations at Camp Lewis."

7BQ, one of our eastern Washington stations in the 7CC district writes the following interesting information: "This station will broadcast the final reports on all athletic contests that take place at the Washington State College here. These notices will be sent in the form of QSTs at nine P.M. of the evening on which the contest takes place."

In Vancouver, station 7ZK is holding down the ether all by his lonesome. 7ZK is the latest addition to our list of specials. This makes the fourth and last special license to be granted in Portland and Vancouver, two adjoining cities. They are 7ZB, 7ZI, 7ZJ, 7ZK. All of these are LD stations of note. 7ZK will use 375 almost entirely. He also is tuned to 220, 270,

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and 300 meters. 7CU is still rebuilding, as is 7BJ. They both claim that it takes a lot longer to rebuild a station than one would imagine.

Oregon

Getting down to the home state, we can say that fewer centralized stations are handling traffic than in a long time, tho traffic still continues to move with little delay. In Portland 7ZI and 7BP are doing the greater part of the work, also 7BR. 7DA is laid up for repairs. 7DS reports that he is no longer in the game on the transmitting end until he can get a new location. The D.M.'s station 7ZB, has just been completed and will be on regularly. A new location has been secured.

Astoria has not been very active during the past month because of the fact that its lone station, 7JP, has been conducting some receiving experiments for the Naval Department on the site of the new Tongue Point Navar Base. 7JP reports: "Results with the sixes are satisfactory, but sigs to and from Portland fade badly. Stations on the Sound are seldom heard at all. Best results are only on very wet or rainy nights. Very few six stations fade here.

"Am getting the local radio organization started again, and before long we will have more stations here. Have a line on 7HD at Seaside, also a couple of stations at Warrenton."

7CW and 7IN at Silverton continue active, and together with 7BH at Salem, succeed in working thru south, also north.

7GQ at Eugene has a spark that carries well.

ONTARIO DIVISION
A. H. K. Russell, Mgr.

Relay work has started in the Ontario Division. The C.W. station of the Manager, using a few watts, has succeeded in establishing reliable day or night communication with 8ANJ, in Niagara Falls, N. Y. The first step toward establishing a through chain throughout Ontario has been achieved. The stations 3AB, 3CZ and 3BP are equipped with C.W. sets.

At present all messages for the Toronto district should be routed thru 8LB at Buffalo, or 8ANJ Niagara Falls, and for western Ontario to 3AA or 3DH at Windsor.

JOHN D. HERTZ

(Concluded from page 43)

management the Northwestern Division is becoming better every day. We know that the Northwest can be depended upon to give a good account of itself in the coming Transcontinental Tests.

HUBERT E. DE BEN

(Concluded from page 43)

the country. 5ZP is probably the best DX station in Louisiana at this time and handles the bulk of the traffic for Louisiana and Mississippi.

Mr. deBen was the first Secretary-Treasurer of the Nola Radio Club of New Orleans. Organization comes first in his mind, and, secondly, assistance to beginners. This has gone a long way towards making him one of the most popular amateurs in Louisiana.

The Sacredness of Amateur Radio

By Francis Frazee Hamilton, E.E., 9ZJ, Director

IN the beginning of time when man first became conscious of himself and his surroundings there developed ideas that, if you injure me or mine, I have the right to do likewise to you. From a few simple rules, rules developed until the household was a lawful unit and what was possessed by one man was contained within that household. Possessions were guarded with knife and spear from all intruders; household against household. Finally the lord and master of his household was called to help guard his belongings and his loved ones from some intruding neighbor from a distant forest who was on a rampage for spoil. This condition gradually developed organized bands of households. As these grew and grew into greater and greater human centers there became a time when the guarding of groups of households were cared for by groups of men elected or chosen for that purpose. In all probability these guards were chosen by the grouped households for their brave deeds or size of stature. The strong man of great visage and muscle was the chosen hero and was worshipped by all. Who has not studied of Goliath?

Now as time went on men became aware that after all a man that goes out and shoots his neighbor should be punished and the new order of things took place with the theory "live and let live". As man began to use that mass of matter known as his mind, the strong man was gradually subdued by reason from the mind of the weaker man, until mind and brawn became

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contestants for the leadership of the newly constituted body known as the clan.

As the clans grew in size and number learning was taught to the younger and the mind once and for all became the leading factor in human progress.

Today the mind rules all things. We live by our minds, are fed by great organizations of men who transport our food from foreign lands, and our clothing may come from the other side of the globe. Our new policy of mind rule is that we rule ourselves. Just as in the clan the chieftan ruled his clan because he had been chosen to rule, so today we choose to be ruled and elect someone else to protect our rights that we might be content and happy to pursue whatever course our mind rules that we do. Or as we choose to put it today, "government by the people and for the people".

Our league can be favorably compared to a clan of men and young men, all citizens of these great United States, who are of a mind to do a thing that is honorable, upright, and a help to other citizens who are not of our mind.

Our league represents a great training school which ultimately is a frat school for the benefit, after all, of travel by sea. This travel becomes necessary because you and I choose to get some of our food from distant lands.

Radio telegraphy really has its greatest benefits to mankind in that man may be protected at sea by some sort of communication in order to safeguard life. On land man has little danger as compared to dangers at sea. It was many centuries before man's mind overcame the sea perils and allowed the discovery of our land, America.

In our league we have chosen seventeen men from our group for a two year period who form our Board of Direction. From this board we get our President, Secretary and Editor of our mind-organ QST. Now, QST is our mind, the mind of the whole league, and within its covers is contained the thoughts of the members of the league. This is necessary because our clan is scattered to all parts of this country and in order that you and I may know what each other think, QST is published for all and by all. Our Board of Direction is our lawful mind whereby rules and regulations may be made which are transmitted to each member's mind by QST.

What a fine thing is QST and the organization behind—the Board of Direction with its president and secretary, and behind all this comes thousands of active citizens, the best America has, bent upon a single purpose: the betterment of, first, myself, second, my neighbor, and, third, my country.

Wonderful, isn't it, that we citizens all of this great land can have the privilege of exchanging our ideas one with another through God's eternal ether? Who else has this privilege? Ah, yes, many have. Men of a different mind than ours have come up who are contesting with us for our rights. Yes, men from a neighboring clan in the woods who are slipping out by night with great pillars of golden fire trying by their dazzling fire to quell our unselfish endeavors for the benefit of mankind in order that their coffers might be filled from the fat of the land.

Our unselfishness is underrated and their selfishness covered up by gold. Gold have we none but we offer our white hands as a sacrifice and they are clean.

Citizens and members of the A.R.R.L., I appeal to you to watch by day and by night and allow no man nor selfish clan of men to take from us that which is rightfully ours for our development both in mind and body which is gain for every man both selfish and unselfish.

Our citizen radio telegraphy, our experimentation, our message traffic, are sacred to us and by them we train ourselves for national emergency. Who asked our president for men at the beginning of the last great war? Why, the Government of the U.S. Did we supply them? Yes, all we had, and they proved to be of the best mettle, tried and true. If not for them my story would not have been written. Inform yourself of the past achievements of our members and the A.R.R.L., the one great patriotic clan of citizens who are ready any time to contest the rights of this great country against any that may attack.

"STRAYS"

(Concluded from page 49)

WOULDN'T IT BE WONDERFUL—

If hens laid audions?

If QST wouldn't print such rubbish as this?—Ed.

If Geo. T. Head of Newton Centre, Mass., got a license?

If in the January QSS tests 5XA would do a little recording between CQ calls?

If Eddy could find a decremeter with a scale long enuf to find out how broad 8XU's wave is?

If 2ZL found out what an awful lot of QRM a CW set can make if run continuously?

If a few phone sets came within hailing distance of the legal wave length?

If NSF would cut out relaying transatlantic stuff on our over-worked amateur wave lengths!

Gee, it must be great to live in the Northwest Division. The hams there get 2000 meters, or so page 30 of September QST says.

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WITH THE AFFILIATED CLUBS

(Concluded from page 45)

made by-laws, and elected officers, a board of directors and a finance committee. Everyone was some sort of an officer but that made no difference. After a few weeks, new members began coming in. The tiny room became inadequate to contain the members. At once a search for new club-rooms was started. An ideal spot was found at 19 Orleans Street. Within a month, an aerial was erected; before another had passed, a complete receiving set was installed and working. WSE, Seagate, N. Y. was the first station heard. Before getting into the big transmitting game, the club decided to see what other clubs were doing. Nothing loth, on August fifteenth, a delegation led by their instructor, Mr. Creaser, made a pilgrimage to Hartford, where they paid a visit to the station of Mr. Maxim (1AW). That settled it as far as getting into the game was concerned. An application for affiliation with the A.R.R.L. was dropped thru the mail-box of the QST office. There are now more than thirty members in the association and by the first of January, a complete 1 K.W. transmitter will be doing relay work, as every member will have a first class license by Christmas. Before next winter, a C.W. transmitter will be installed. Mr. Mix, Asst. Division Manager, 1TS, said recently that he had been looking for something "live" in Springfield. How about it, Mr. Mix? Have you found it? We'll say you have.

At one of our recent meetings a class in code practice was copying from the Marconi-Victor records when Mr. Isaiah Creaser, the inspector, conceived the idea of using the phonograph in conjunction with the ordinary buzzer for code practice.

It has been in the past the practice of every member of the association to bring their head phones with them for code work. This practice has been eliminated by the use of the buzzer and reproducer of the phonograph. By placing the needle of the reproducer in a prick punch hole, upon the armature of the buzzer, the vibrations of the buzzer are greatly amplified. By making several prick punch holes in the armature, about ⅛ of an inch apart, different tones can be obtained.

Mr. Creaser has also tried placing the reproducer needle upon the diaphragm of the receiver for incoming signals, and the same idea has worked, and stations have been heard very loudly.

These ideas may be of interest to other associations. Try them.

Essex County Radio Assn.

This association has a paid membership ten times as large as a year ago and has sections in almost every large city in the county. The County President and president of the Lynn Section, George H. Garvey, went to Lawrence and formed a section there with twenty eight members the first night; elected officers and voted to affiliate with the A.R.R.L. through the Essex County Association.

The Lynn Section holds meetings every week and is increasing its membership at every meeting. It has a bunch of real live wires for officers and about fifty five licensed stations. Traffic cannot be handled until very late at night and the QRM condition is the hardest problem for the section. A. V. Johnson has been appointed District Supt. of the A.R.R.L. and the section hopes to have his co-operation in regulating QRM. All messages for the county can be handled by 1DY, 1IS or 1SAS.

The Salem Section has secured a room for instruction and meeting two nights a week from the school department. This room will seat about 150 and is on the first floor of the administration building. Every station using a transmitter, whether a buzzer, spark coil or transformer, is now licensed in this section. Five transformer stations are ready to handle messages and a schedule will be arranged.

The Beverly Section has secured buzzer apparatus from the School department and with the co-operation of the Y.M.C.A. has arranged a schedule of instruction for the winter.

Gloucester and Haverhill are yet to get together and form their outline for the coming season.

The greatest asset the Essex County Association has is the hearty support of the Salem Evening News. The News has taken great interest in the association and, through publicity given to its events and its position of showing the value of the amateur radio men to its readers, has greatly aided the association.

QRM & QRN REDUCTION

(Concluded from page 17)

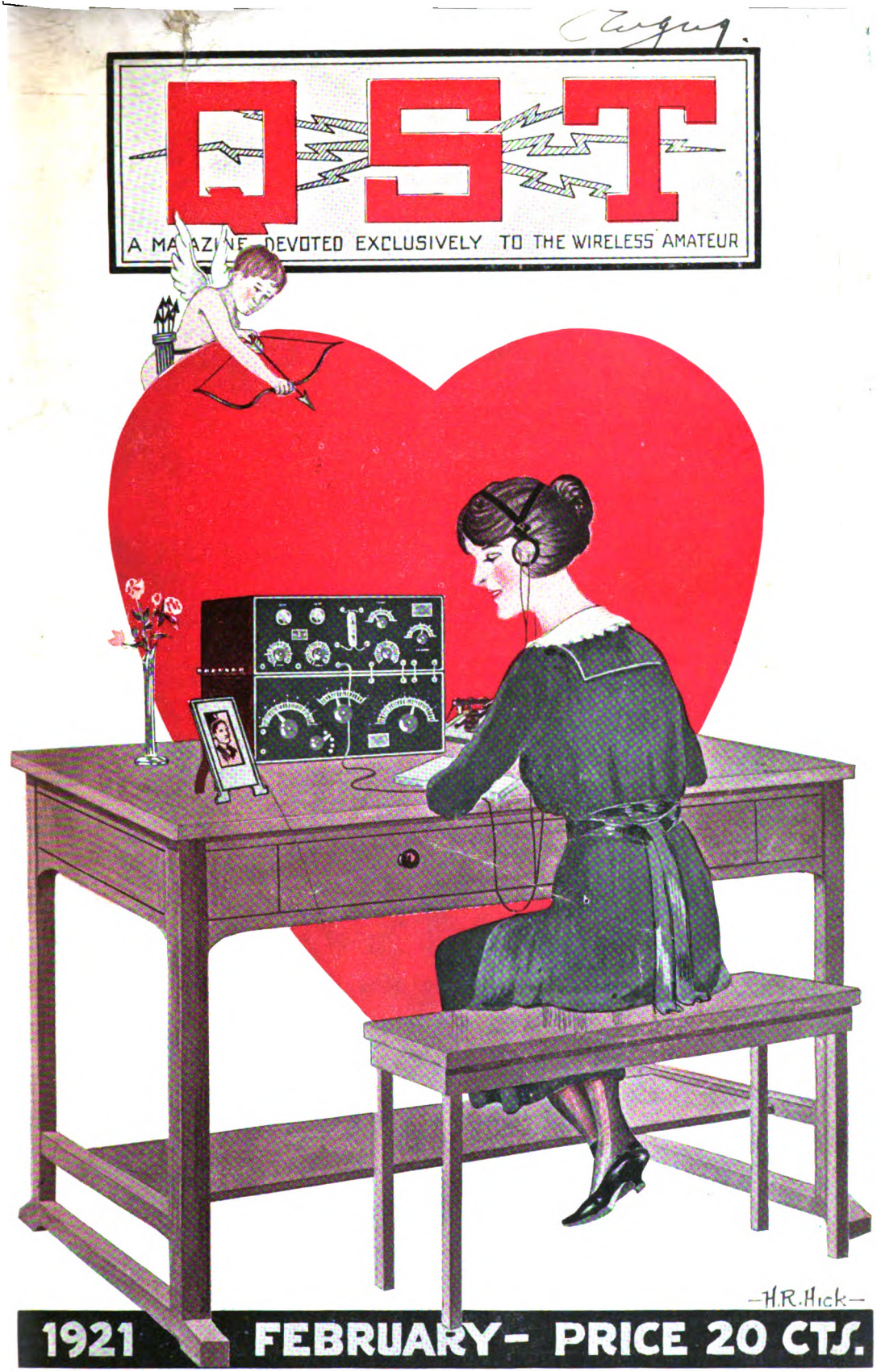
nection with other energy gathering units; roughly, the use of many small contributing elements which provide for close tuning and little static absorption.

As to the concrete success of my system, it is hard to say anything as regards QRM that would indicate the circuit's selectivity, but I have been able to copy very faint signals through the transmission of a nearby powerful navy station —wave lengths not differing much either. As far as QRN goes—well I have copied messages that a navy station here could not get, sent at ten words a minute, each word repeated three times!

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QST

A MAGAZINE DEVOTED EXCLUSIVELY TO THE WIRELESS AMATEUR



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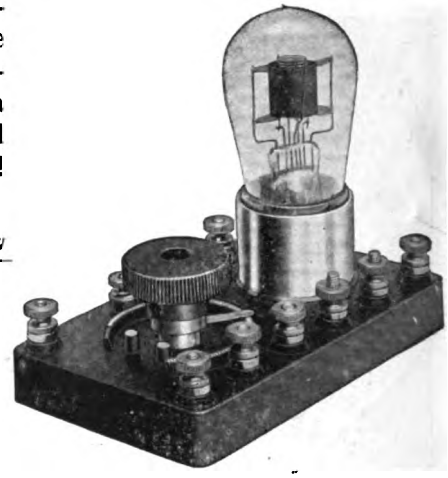
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WILL Greatly increase the receiving range of your station. The combination shown opposite consists of the "A-M" Detector Unit and the Radiotron U.V. 200 tube. This makes a complete VT Detector outfit,—well within the reach of every amateur!

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THIS NEW detector and amplifier tube is the latest product of the research laboratories of the General Electric Company. It has been specially designed to meet the requirements of the amateur and experimental field, viz: the production of a tube which would prove a sensitive detector and a superior amplifier, and which could be operated off a single standard 22½ volt plate battery.

Radiotron U.V. 200 is the best radio detector and audio frequency amplifier yet produced. It is particularly adapted to standard regenerative circuits, in which it functions with greater sensitiveness and stability than any other tube.

Best detector action is provided by a grid condenser of 0.00025 MFD capacity and the Radio Corporation's standard grid leak of ½ MEGOHM resistance. The plate voltage must be closely adjustable from 18 to 22½ volts. The requisite variation of the plate voltage must be obtained in three ways: (1) By a standard "B" battery potentiometer; (2) By a "B" battery with taps to each cell; (3) By a special "A" or filament battery potentiometer of 200 ohms which will be manufactured by the Radio Corporation. In the case of the last mentioned method the negative terminal of the "B" battery (which is tapped from the 12th cell) connects to the variable contact on the "A" battery potentiometer.

RADIOTRON U. V. 201

THIS TUBE is also a newly designed detector and amplifier of the pliotron type, which was developed in the General Electric Company's research laboratory. Experts who have tested this tube pronounce it to be the most efficient and stable amplifier available to date. The normal plate voltage is 40 (2 standard "B" batteries), but plate E.M.F's up to 100 volts may be used with increasing amplification. Price, $6.50.

All Radiotrons are manufactured in accordance with rigid specifications, assuring a uniform product. They are made to fit standard four-prong sockets. Watch future announcements for data concerning the other types of tubes and devices which will be soon placed on the market.

The NEW Radisco Better "B" Batteries, (Tapped), 22 1-2 volt, 15 cell, with variable voltage feature, . . . $2.65

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THE OFFICIAL ORGAN OF THE A.R.R.L.

QST

FEBRUARY, 1921.

VOLUME IV No. 7

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QST
A Magazine Devoted Exclusively to Amateur Radio

I. C. W. from Sixty-Cycle Current

A Method for Obtaining Radio Frequencies, Completely Modulated at a Musical Frequency, with an Electron Tube Supplied from a Sixty Cycle Source.

By L. M. Clausing*

IT is often impossible or inconvenient to obtain the high voltage D C. or the high voltage 500 cycle A.C. required for the plate supply of transmitting tubes. The method about to be described will eliminate this difficulty where 60 cycle A. C. is available.

When alternating current is supplied to the plate of an electron tube to which an oscillating circuit is attached, one half of each cycle is transformed into radio frequency currents, and this radio frequency is therefore modulated completely at a frequency equal to the supply frequency. Commercial frequencies below 133 cycles cannot be used effectively for this purpose because the note obtained is very low and the signals are hard to copy through static.

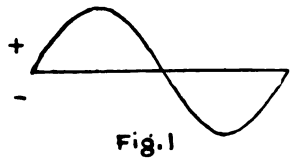
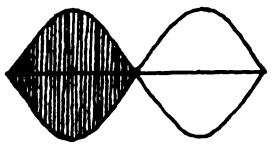


Fig. 1


Fig. 3

By introducing a suitable current reverser in the alternating high voltage supply it is possible to reverse the alternating current periodically at any desired frequency. This is shown in Fig 2.

Fig. 3 illustrates the envelope of one cycle (frequency 60), converted into radio frequencies by means of one vacuum tube.

Fig. 4 illustrates the envelopes of one cycle (frequency 60), reversed so that 480

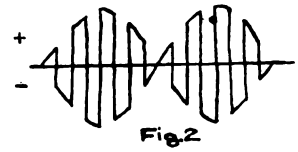


Fig. 2


Fig. 4.

cycles are produced, converted into radio frequencies by means of one vacuum tube. A single glance at Fig. 4 will probably leave the impression that anything but a musical note will be obtained with such large variations in amplitude, but on second thought it will be seen that the amplitude of the envelopes varies similarly to those obtained from a non-synchronous spark set. An actual test has shown that the tone is very much like that of a non-synchronous spark set.

The addition of a transformer and such a rotary reverser will transform ANY TUBE SET into a universal interrupted continuous wave set which can be used equally well on A.C. or D.C. if the motor

* U.S. Naval Radio Research Laboratory, Bureau of Standards, and member of the A.R.R.L. Advisory Technical Committee.

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is designed to operate on both currents. It is of course understood that the usual high voltage D.C. motor generator is necessary if the set is to operate on D.C.

The signals from an experimental set, operated on 60 cycles, tuned as sharply as those from any interrupted continuous wave set.

Any scheme for reversing the high voltage current at high speed can be employed with this system. Arcing at the brushes can be prevented by shunting a condenser across the source.

gap and stationary spark electrodes are used in place of brushes.

So far only an experimental outfit has been tested but it is hoped that further refinements will be possible when another set is constructed.

Editor's Note.—This is a real good idea for the origin of which we are grateful to Mr. Clausing. If we are going to use A.C. on the plates some scheme is necessary where the tone for I.C.W. telegraphy can be improved over the lighting frequencies.

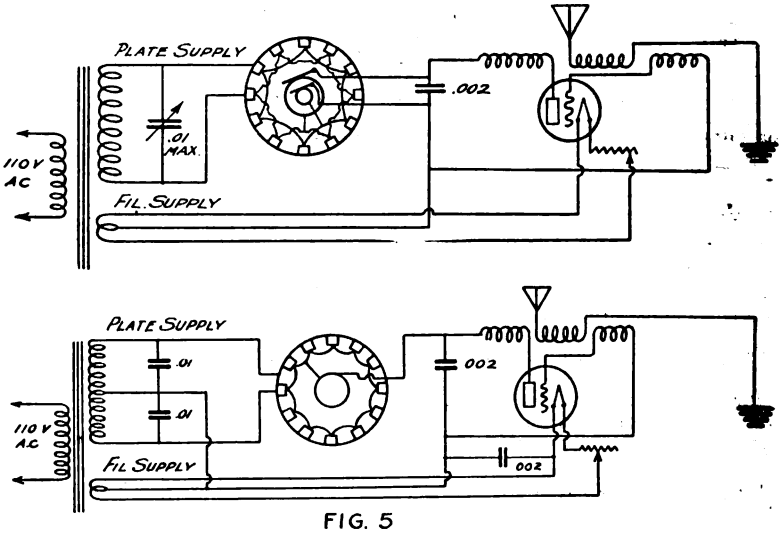


FIG. 5

Fig. 5 shows two methods of connecting this system to a Meissner oscillating circuit. The rotating reverser as shown above will reverse current for small tube sets operating on less than 1000 volts with ease if the spacing between the contacts on the rotating disk is over ¾ of an inch and the brush width is not over 1/10 of an inch.

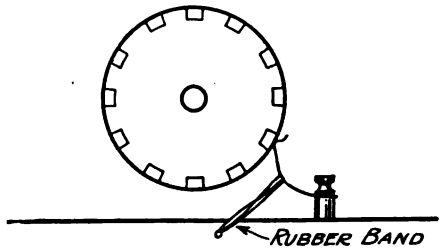


FIG 6

Phosphor-bronze brushes shaped as shown in Fig. 6 with a rubber band for damping vibrations have proven satisfactory.

Higher voltages can be reversed for large tubes if the rotor is constructed similar to the rotor of an ordinary spark

Our best idea to date has been to use double the number of tubes so as to employ both sides of the wave, and then modulate the output by buzzer or chopper —not a very simple scheme. Mr. Clausing's method should entirely answer the problem.

The construction of the rotating reverser should not be difficult—a Bakelite disc four or five inches in diameter, ⅜ or ½ inch thick, with segments inserted commutation fashion and alternate ones connected. A diameter of 4.77 inches, for example, provides a periphery which will accomodate 12 segments ¼ inch wide, with 1 inch space between segments.

ERRATUM

On page 32 of our January issue, under the heading "A Bad Situation", the Bureau of Standards is reported as having advised us that in their opinion there were more unlicensed transmitters in the cities of Cleveland and Philadelphia than there were licensed. This statement on our part was in error. The reports relative to interference in these cities were received from individual recorders, not from the Bureau of Standards. We are sorry for the error.

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2ZM's Radiophone and C.W. Transmitter

By L. Spangenberg
Presented at Meeting of Radio Club of America, Columbia University, May 28, 1920.

THE following is a brief description of a Radiophone and C.W. Transmitter which was constructed by the writer and which has been in use for the past four months at his station on an antenna having a fairly low resistance and a natural period of 250 meters, with quite satisfactory results.

An attempt has been made to show the design of this set by photographs, Fig. 1, 2, and 3, which together with the wiring diagrams and cuts, I believe will show same quite clearly.

It was found that for phone or buzzer transmission using two tubes as oscillators, only one tube was needed as a modulator to give almost perfect modulation, although the set is arranged to use two tubes as modulators if found necessary. It is also so arranged that all four or part may be used in parallel as oscillators for C.W. Transmission.

The antenna current on different stages of transmission is as follows: Radiophone and Buzzer Transmission using two tubes as oscillators, with all circuits properly adjusted, six-tenths ampere; when using all tubes as oscillators for C.W. Transmission, an antenna current of 1.5 amperes may be

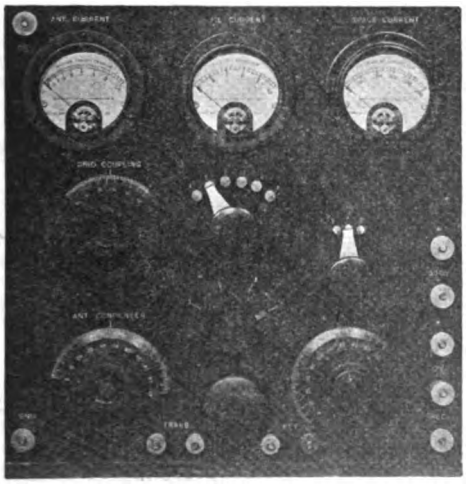


Fig. 1

obtained. The wave length used when the above results were obtained was 325 meters, that being one of the wave lengths called for in station license, but may add that on shorter wave lengths almost the same results can be obtained and on longer, still better. The set has a range of from 200 to 425 meters.

The bakelite panel on which the meters and different parts are mounted is 12″ x 12″ x ¼″ and fastened to a wooden base 12″ x 8″ x ⅜″, well seasoned, and braced to panel as shown in Fig. 2 and 3. It will be noticed that almost all of the parts are of a standard make and may be

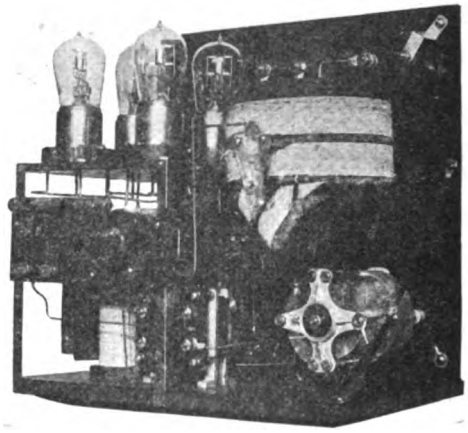


Fig. 2

purchased from any supply house handling radio equipment.

The schematic wiring diagram, Fig. 4, shows the circuit used and a simple way of changing to radiophone, buzzer or C.W. transmission by the means of a DPDT switch, with the aid of a SPDT switch to change from radiophone to buzzer transmission while the DPDT switch is in the first position. The diagrammatic wiring plan, Fig. 5, shows the actual circuit of this set, using a standard make of five-contact drum switch which replaces the DPDT switch and performs other duties, such as closing the filament circuit, high voltage circuit, and changing the antenna from sending to receiving, also having a neutral position for all circuits. By using this type of switch the operator can very readily change to any type of transmission, and then back to the receiving position, at the same time opening both the filament and high voltage circuits.

The rheostat regulating the filament current may be of a standard make, but when using four tubes (the current being too heavy for the wire) it was found necessary to divide the resistance, making

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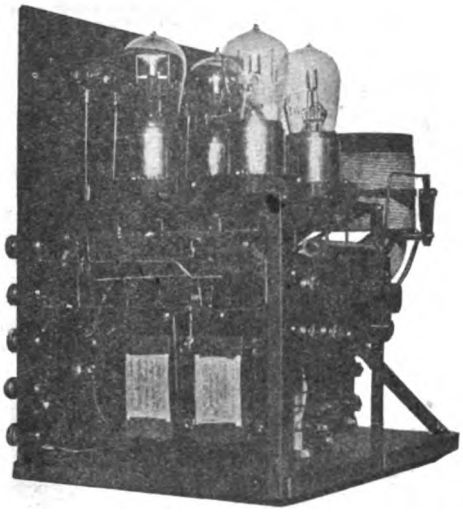


Fig. 3

It will be noticed that a C battery of about 40 volts is used as a biasing battery in the grid circuit of the modulating tubes as shown in the wiring diagram.

The type of tubes used is the well known VT-14 and on which the above results were obtained. By using the VT-2 type of tubes, 25 percent better radiation may be obtained on all kinds of transmission.

The plate voltage is obtained from a ¼ H.P. 110 v. A.C.—500 v. D.C. motor-generator, and the proper voltage required obtained by placing an adjustable rheostat in the field circuit—350 volts being the voltage used at all times.

The filament current is supplied from a 12-volt storage battery and regulated by the filament rheostats.

The microphone transmitter is an essential part of the outfit and the best that can be obtained should be used; that is, wherein the resistance is varied with the voice very

(Concluded on page 23)

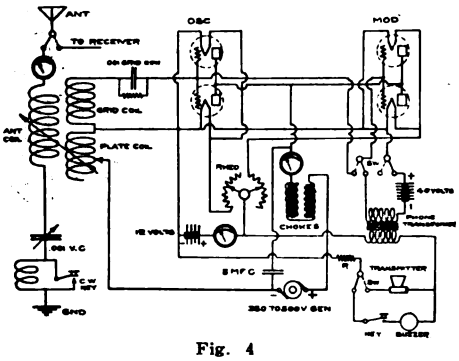


Fig. 4

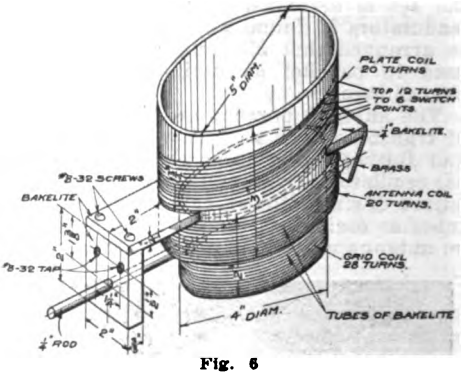


Fig. 6

two variable resistances, one for the two oscillator tubes and one for the two modulator tubes, as shown in the wiring diagrams, adjustable independent of each other (by the double-knob control located in lower right hand corner of the panel, Fig. 1.—Ed.)

The filter arrangement using two coils and two ¼ mfd. condensers is shown in Fig. 7 and is self explanatory.

The Inductance is shown quite clearly in Fig. 6 and may be mounted on back of panel as shown in photographs. (Note: The inductance forms are circular in cross-section, not oval.—Ed.

The microphone transformer is a standard make of the closed-core type and works quite satisfactorily.

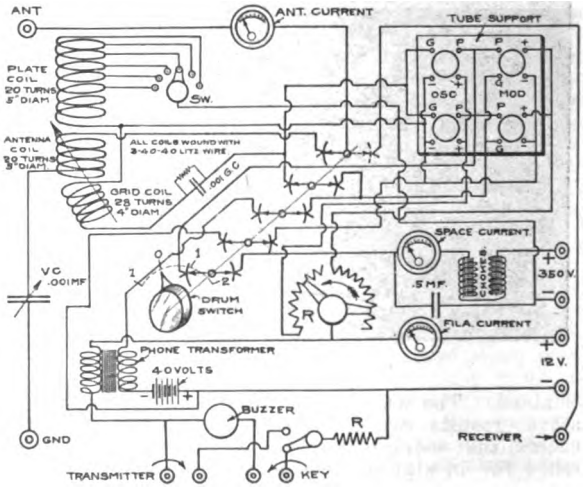


Fig. 5

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Rotten S. O. L.

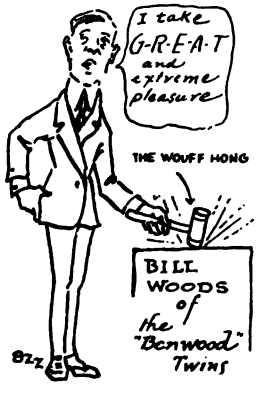
By The Old Man

Don't dare to miss reading this. T.O.M. loses his grouch and at our special request reports the Midwest Convention. Here is all the news. And if you, gentle reader, come under the classification described in this story, get wise to the moral thereof and save up your berries—for the First A.R.R.L. National Convention in Chicago next September!—Editor.

THAT'S what it is, you stay-at-homes. You are sure out of luck. You missed the biggest thing that ever came down the radio pike. That's what the A.R.R.L. Midwest Convention at St. Louis was. I had the best daggone time I have enjoyed since a certain little affair down in Cincinnati, when I was young and frolicsome, and a certain somebody lost seventy-five percent of a perfectly good right ear.

Matty himself said it beat the Chicago Convention, and by all accounts that was a good one. Yes sir, she was some show, and The Old Chief was pretty near getting it right when he said, in his good-bye speech the last night, that the St. Louis Convention marked the high water of Amateur Radio. The darned thing set me back the price of a new Dubilier condenser, capacity naught one, twenty-five thousand volts, my greatest want; but it was worth it. I accept with pleasure our Editor's request to report the business.

I never went to a Radio Convention before, and I was not certain what you did at one. Living out in the bush, all I know is Radio Club meetings. I walked into the Hotel Statler that first evening with considerable hesitation. It's a whale of a place, and there were a slew of folks standing around in the gilded lobby. I thought every one in the hotel was a radio man, and as they appeared to be a pretty pert looking lot, my feet cooled off considerably. I milled around carefully for a spell and finally discovered that everybody





Schnell, Corlett, Hamilton and Stewart having a Hamfest.

was not a radio bug, but that the A.R.R.L. end of the business centered around a little veiled lady sitting at a desk with a lot of blue badges. I hung around awhile to see what you were supposed to do, and in a few minutes some of the kind I know all about came around, gave their names and call letters, deposited a five-spot and were given a blue badge. This looked easy, and having the five-spot and a little to spare besides my tickets home, I sailed up, dropped my spot, gave my dope and got my badge. With this on my front, I felt I looked like a million dollars, and wasn't afraid of anybody, from a bellhop up.

The program said they were going to pull off something on the seventeenth floor. Seeing the blue badges all going into elevators, I joined in and boarded one. Back in our town all the buildings are not seventeen stories high. Hence, when the elevator girl slammed on the hoisting gear, I was not prepared. The outfit went off

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so daggone sudden it blamed near sat me down. Talk about acceleration and oscillation! This elevator had every thing beat I ever got aboard of. Like a chump, I never thought that if they start up quickly, they probably will also stop quickly, so about the time I got my knees back straight and my hat reassembled on me,



1AW heard QSA in St. Louis.

the girl jammed on the brakes and—u-u-uuup came everything. Nothing inside of me failed to respond. Every last thing fetched away and rose up. What between my supper, my internal affairs, and the decrement of that oscillatory stop, I was busy trying to swallow things. In the middle of operations we landed at Nr. 17, some doors shot open, and we were deposited plump into the middle of a mob of radio bugs all wearing blue badges, and all shaking hands and all smoking cigarettes fit to bust. Before I had time to catch my breath, somebody grabbed me by the arm and looking around, I found myself gazing into the smiling face of Mr. K. B. Warner, Editor of QST, Secretary of the A.R.R.L. and all around good fellow.

I recognized Warner right away from his picture in QST, and darned if it didn't seem as though we had always known each other. That's the funny thing about these Radio Conventions. You get to know folks intimately in five minutes time. Warner whispered a few whisps on a confidential matter and we were getting along fine, when a keen-eyed, alert young chap with something evidently heavy on his mind, pushed through the crowd headed for Warner. In less time than it takes to tell it, I was shaking hands with the redoubtable Bill Woods—Benwood Bill—the livest wire in Amateur Radio. Just think! Have been hearing his signals and reading about him for years, and here we were shaking hands and looking into each other's smiling faces.

Bill was busy as blazes. He had the whole blamed Convention on him. He had something urgent with Warner, and the two left in a minute. Before I had time to get straightened around, the crazy elevator behind me exploded again, and another bunch was disgorged into the room. I gasped for air when I realized that the gray-haired middle-aged man who came out first was no other than our President, Mr. Hiram Percy Maxim. By the Great Horn Spoon! Right here in the same room! Had known him for years and years, it seemed like. Had written him no end. The Old Chief, himself! Say boys, it was just the greatest feeling that came over me that I have had in many a long year. It just grips you. I looked for Tuska, the other old-timer, but could not find a face that filled the bill. He did not come, daggone him. He ought to be ashamed of himself. We all would have given a good deal to have had a look at him and a shake of his fist. But that will be one of the treats of some coming Convention. We all have a warm spot in our hearts for that boy Tuska.

I sure did want to shake the fist of The Old Chief, so, edging up, I introduced myself. He gave me one swift, sharp look straight in the eye, and then we shook. Say, you fellows, it was worth the whole darned trip. We laughed and nudged each other like a couple of kids. Gosh, I never had such a wonderful few minutes. The Old Chief and I have several good jokes between us which are not for publication. We whispered and laughed and were right in the thick of the daggondest best time you can imagine when somebody pushed up and I was introduced to a bald-headed gent I certainly ought to have known. I got the name "West", but it did not sink in until his call letters came through. Old 8AEZ! For the love of Michael Angelo! West, of Lima. West, the fellow with the loudest, cleanest, sharpest and nearest-to-200-meters spark of pre-war days. Actually shaking hands with him! We were having a great time of it when somebody asked me to shake with another one, and bust my garters if it wasn't Prof. Candler of St. Mary's, old 8NH, recently



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8ER, and now 8ZL. Well! well! so this was the owner of the big noise over in the western part of the State! Say, boys, he looks like his picture. But you would never in the world suppose by his looks that he can roar as loud as we hear him every night. Of course the next question was, where is Mrs. 8ZL? Had not come. Rotten SOL. Too bad. Wanted to see her specially. Another old timer for some future Convention. Won't she make a hit the first time she gets up and makes a speech before a Radio Convention! The lady has something coming to her, you hear me.

The Professor and I chatted a minute and all kinds of familiar call letters passed by. I saw 8ZA, 9AU, 9AO, 5ZP, 5IP, 5YH, 4BZ, 9PY, 7YS, 8OJ, 8ZZ, 9EL, 9CS, 5AE, and look at the badge on the tall fellow! 9ZN—Matty, himself. Why man, here within these four walls was the greatest galaxy of radio talent ever gathered in the history of human affairs. To miss such a thing is like missing being born at all. I simply had to shake with Matty, so I squirmed through and in a moment we were at it. He told me how I came in at Chicago, and I darned near kissed him. How you do love to hear



Inside Dope: 8ZL is interested in astronomy—guess trying to find out if 8ZL is heard on Mars or the moon.

somebody tell you that your signals are QSA. If Matty spoke the gospel, I guess Old Betsy is not so rotten.

Support me! 9CP! Do you mean to tell me that child is 9CP? Well, if that don't yank the bun off the shelf! Say, you chaps who never get away from the front porch (and this applies to Marion), the owner of that spark we hear signing 9CP is a lad in short trousers. That's what, and you have to go to Conventions to find these things out. 9CP was only one, and before I finish with this yarn, I will tell you something more about youth which will knock your eye out worse than this.

So, that is 9ZJ, over there talking with Mr. West! 9ZJ has that beautiful tone that we have all wondered about. He is Mr. Hamilton of Indianapolis, one of our A.R.R.L. Directors. You don't mean it!—Is that Godley! Paul Godley, designer of the famous Paragon, the best tuner ever built for short wave work? Some distinguished company, I'll tell the world. I am told that this Godley person probably knows more about short wave receiving efficiency than any living man. And right here in the room with us! What's that,—8IB? I've seen that call before. Fine looking young fellow. And look at the



Matty and the gang there from Chicago.

Third District gentleman. Who is he? Mr. Stewart, 3ZS, from Philadelphia, and another A.R.R.L. Director as well as legislation expert. And who is the husky with the Fifth District call? Corlett, still another A.R.R.L. Director, and all the way from Dallas, Texas. That is some business, fellows, coming all the way from Texas. Think of it, you rocking chair experts. 5ZC right here in the room with us. I hear him every time he touches his key, but I never expected in gawdsworld to meet him.

About this time Benwood Bill fell upon the desk with a heavy mallet and made conversation difficult with his QRM, so we all took seats. Mr. Benson, the Division Manager of the Midwest Division, took command of the meeting and after a neat spiel, introduced Mr. Woods as the permanent chairman. Benwood Bill delivered an oration that made you wonder why he never ran for office and then called upon the Midwest Division officers and the prominent A.R.R.L. officers and directors. It was simply great to see these well known people and hear them talk. All of us had heard of every one of them, and it certainly was a great occasion to listen to them. Benwood Bill called upon anybody his fancy lighted upon, and it made no difference whether you had a speech or were tongue-tied, or were free, white or twenty-one or not, you simply had to get up and orate. This takes nerve from most of us, but Bill has no ideas on this matter of nerve. He just goes crashing on regardless. He was just starting to lead a new

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innocent to the slaughter when a feminine voice, in trouble, was heard signalling S O.S. on a broad wave, and somewhere off to the southeast. Naturally everybody rubbered to see what had busted loose. She had evidently been hove out of the elevator and had got lost, and here she was yapping



Power-Factor-and-Gap West.

for help. She seemed to want her husband, or somebody else who would kindly take his place. It seemed so entirely out of harmony, not to speak of resonance, for a young woman to be telling her domestic troubles at a radio meeting that everybody began to wonder whatell. I could not believe what I was hearing. She put on full power when she let go her third yap, and that brought the chivalrous ones to their feet. Mr. Forshey and Mr. Godley, who evidently had ideas about the when-knighthood-was-in-flower business, gracefully arose and went forward to offer their kindly services to the troubled lady. You could see all sorts of romantic possibilities from these two gallants. But, 'twas not to be. A male voice, over in the center of the room, arose and knocked the ding-busted pudding out of the romance. Evidently it was hubby. He did not appear to be possessed of any romance at all. Instead of gracefully floating over to the beautiful lady and reasoning with her about talking so loudly in public, he turned in his seat and told Mame to go on back downstairs and sit down and wait. He was busy learning about radio . She gave him a pain in the neck, always butting into his radio interests.

Instead of calming Mame down, this caused Mame to blow up for fair. She nearly knocked the romantic Forshey and Godley down, made a rush for hubby, and grabbing him, started to mop up the floor with him. She had evidently lost her patience completely, and did not care whether she found it again or not. She let it be known that she had little or no use for radio or radio people, and she was for getting hubby home even if she had to beat him into insensibility and crate him up and ship him by express to do it. She was a determined little person.

He broke away and I'll be darned if they didn't start a foot race in and around the chairs and aisles. By this time, the whole daggone meeting was in an uproar. Everybody forgot radio and some of the more joyous ones had difficulty in keeping out of the game themselves. It began to look as though a real old-fashioned rough house was in the making, and that somebody better begin thinking about calling the police, when these two joined hands and gaily skipped out through a rear door. Benwood Bill whaled the desk for order, and never cracking a smile, and acting for all the world as though this little episode was nothing in a busy man's life, remarked that the QRM seemed to have subsided, so we would go on with the meeting. Forshey and Godley went into hysterics, and the rest of us went on with the meeting.

Editor Warner gave us a scolding about not obeying the law better. He asked how many of us in the room were really obeying the radio law as to wave length, wave purity and decrement. He wanted the law-abiders to stand up. A man with both arms cut off at the elbows could have counted the law-abiders on the fingers of one hand. Warner told us we ought to reform, and practice what we preached. He is right, and this meeting will do a lot of good. I know I for one am going to fix certain things up and if anybody knows where a respectable decremeter of moderate age can be secured at reduced price, will they please communicate. Intentions are strictly honorable.

Traffic Manager Schnell was dragged out along about here to give us a talk about message traffic, and he advocated cutting out the greetings-by-radio business



"Paragon Paul" Godley.

and getting down to brass tacks in our messages. It is good advice, but how we are going to get this uplift stuff across to the young things who write out the messages on a sheet of perfumed paper gets me. Schnell did not advise how to

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transmit the perfume along with the message, which is something that needs attention from some of the experts.

A Mr. Haddaway was then requested to step forward and spiel a few. The gentleman not being in the hall, a Mr. O'Neil offered to speak for Mr. Haddaway. It seemed that Mr. O'Neil had been out to Mr. Haddaway's house. He explained that



Does anybody remember who sat at the northwest corner of the platform at the banquet?

Mr. Haddaway was a gentleman of the advanced age of seventeen, had a radio station, and in this radio station he had a spark transmitter, a C.W. transmitter, and a radio telephone, all of which he had "built himself". We hear so much of this "built himself" stuff that we choke at it mostly. In Haddaway's case, there was nothing to choke at. Haddaway really had built everything himself. He had to or he would not have been able to get it. By everything, Mr. O'Neil said he meant EVERYTHING. He meant storage batteries, B batteries, telephone transmitters, amplifying transformers, chokes, filters, condensers, and BULBS. Yes indeed, BULBS! The only thing he did not make was a pair of pliers. He bought these.

What do you think of a lad of seventeen who makes his own bulbs, soft and hard, for detector and amplifiers? Makes his own grids, filaments, and plates, pumps his own vacuum, and by heck, builds his own vacuum pump to pump his own vacuum. Mr. O'Neil said he tried some of these bulbs at his station, and found them better than a good many he had bought. He said when Mr. Haddaway burned out a bulb he simply went down into the kitchen and built himself a new one. It was nothing to him to burn out a bulb. During the evening, if the signals did not suit him, he went down stairs and made a new bulb to suit the weather. Going some, strikes me. You have to go to Radio Conventions to find these things.

The next evening we had a look at Mr. Haddaway, and listened to a well delivered speech by him. He is a good looking lad with the appearance of a scholar and a reader. Some day he will be a radio engineer, and Amateur Radio, the city of St. Louis and the United States of America will be very proud of him. Mr. Maxim in his remarks at the close of the technical session said that it had been a great honor to have been present at the same meeting with Mr. Haddaway, radio engineer of St. Louis, Mo., aged seventeen.

Legislation and the bill now pending in the Senate then came up for a go. Benwood Bill took the gloves off and handed the bill a few. Mr. Stewart, the League's expert on these matters, was called upon and he told about the situation and how if the bill becomes law it will give into the hands of a commission the power to change our wave lengths three times a day if anybody on the commission feels so inclined. Mr. Stewart says the bill gives no opportunity to be heard except as to how hard they will soak you in the way of a penalty and what kind of a license you may have. There seemed to be several other little jokers in the bill which would make Amateur Radio dependent upon how some official at Washington happened to digest his breakfast.

Bill was chock full of fight on the subject and was for doing something violent and doing it soon. After some discussion, a committee was appointed to draw up a set of resolutions to be sent to the Naval Affairs Committee at Washington, and which would convey to them the esteem we held them in. This was done the next day, and seventeen telegrams were sent, one to each member of the Senate Committee on Naval Affairs at Washington, and so worded that between the lines it was seen that the amateurs of the country desired and hoped that each member of the Committee would choke to death at his early convenience.

A collection was taken up to defray the expense of the telegrams and any funeral incidentals that might be entailed. This matter is evidently a serious one, and if any of you stick-in-the-muds on the front porch have not yet written your Senators, for the love of Mike come out of your trance and get up enough pep to borrow a fountain pen. As Benwood Bill says, "DO SOMETHING BESIDES SLEEP".

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The next night was even better than the first one. A blackboard had been set up and several of the best known radio men in the country discussed things ranging from aerials and grounds to decremeters. A lot of new faces appeared, including a very ruddy and smiling one attached to the upper end of a big man, known on the West Coast as Mr. A. E. Bessey, A.R.R.L. Division Manager, Pacific Coast Division. Mr. Bessey had come all the way from San Francisco, and he was given an appropriate welcome, part of which was three rousing cheers. He made the representative from the Sixth District and it was said that that



"Sunny Jim" Bessey from Sunnyvale.

completed the list, and for the first time in Amateur Radio history, representatives from all nine Districts were present.

Mr. Bessey told us about the way the amateurs on the west coast feel when it is suggested that we break up into a lot of little leagues instead of one, big, national A.R.R.L. It only shows the strength that we have.

Then Mr. Paul Godley of New York talked to us for an hour. I think he gave me more points than I ever got in the same length of time before. I could have listened to that man talk all night long. He can draw audion circuits blind-folded with both hands tied behind him. He sees the little electrons chasing each other through the circuits just as though every one carried an automobile marker. I learned more about running a receiving tuner than I ever knew before, and it is my guess that several others followed suit. Mr. Godley advises against monkeying with the knobs until you have thought out what you want to do. It is good advice all right, but I can see some of these Eighth District galoots thinking about the moves before they make them—NOT. It is their system to try everything. After listening to Mr. Godley, it is my notion that about one amateur in one thousand knows what takes place when you change the inductance or the capacity values or the coupling in a regenerative tuner. I will bet an E.I. catwhisker detector that there is not one in ten thousand who knows what takes place inside a vacuum tube.

After Mr. Godley finished, Mr. Benson asked for recognition from the floor. Benwood Bill consented to recognize him, and Mr. Benson then explained that some kind of a nut was without and wanted to show a new STATIC ELIMINATOR. While he was speaking, the nut walked in and wheeled a hand truck carrying a crate down the center aisle, and unloaded it in front of the platform. Bill did not cotton to the notion. He bucked. He asked questions regarding the static eliminator person which were bordering on the personal, and remarked in very firm language that it was all right for any manufacturer of radio apparatus to seek to demonstrate his junk, and probably many of the members would no doubt like to see it, but just the same for a man to butt into a meeting without first securing permission got his goat. The more he talked, the madder and more oratorical he became. Seemed like Bill was going to spill over and somebody with a hand truck and a static eliminator would be bounced in a few minutes. Then somebody else suggested that as the machine was here in the room and ready, the members better see the demonstration. By this time, I began to think I was going crazy again, and this made me suspect there was something phoney getting ready to be pulled. Then somebody else suggested that Mr. Maxim open the crate. Then it was certain there was something doing. The Old Chief had his suspicions also, for he approached the mysterious box cautiously. He had just laid his hand on the blamed thing when it busted open, and young lady dressed for anything but winter weather hopped out. She started to sing and was for perching on The Old Chief's shoulder by the look of things, but was satisfied with hugging him. Then she circled around, singing something to the effect that she was loving somebody or something terrible hard, but was not getting any satisfaction. She tried to get a crumb of sympathy from a gent with a Fifth District badge and a military uniform on him, but it was ND. Then the damsel gave a squeal and disappeared off through the back door. The gang roared and Benwood Bill was seen to concede one slightly used smile. After things quieted down, he remarked that now that the Static Eliminator had been eliminated, we would go on with the Convention.

Young Mr. Haddaway was around this time, evidently to hear the technical talks, and it was then that he made the speech referred to earlier in this report. Left stranded on a desert island in the middle of the Pacific Ocean, I have no doubt that

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this young man Haddaway would have a 500 KW set in operation inside of forty-eight hours, if he only had a pair of pliers to start with.

Mr. West took a crack next and gave us a fine talk on what happens in a rotary gap. He showed how much more could be obtained than we now get if we would reduce certain losses, which were easy to reduce. He is another almighty interesting talker. He knows his story and it certainly gets under your belt to hear him point out the possibilities that are lying right there at your hand. He told about how a well behaved condenser saves up its money and then spends it all in one grand and glorious bang, and he showed how quickly the rotary gap must come up and make its getaway, if it is to linger only long enough to permit one dozen oscillations in the closed circuit. It seemed that a gap must rotate at a trifle like 150,000 revolutions per minute. Several young men took copious notes at this juncture. They evidently intended to put a larger pulley on the motor when they got back home. It will only take something like a forty-foot pulley on the motor and a half inch pulley on the rotary.

I was sorry Mr. West neglected to tell us something about old 8AEZ. In the happy days of long ago, his spark was a peach. We all would have liked to have heard him tell how he did it. Gosh, how this hope of getting long distance does grip you. It is just like when you tear off eighteen or nineteen messages in series of five or so, and every time the other fellow comes back with a snappy and solitary R and GA. Once in a long while we hook into somebody who can do this and we get locked together and everything seems to go one hundred per cent perfect. Just good clean sending and good clean receiving and not one single superfluous signal. Mr. West makes you feel like you do when you pull one of these stunts.

He mentioned fading and NAJ, and one of his listeners got interested to the extent of telling him that NAJ had the swingenest signals ever he heard come out of any radio station. Prof. Candler blamed this on the Northern Lights, and sun spots, and things in general. Mr. Miller, of the Jewell Instrument Company blamed it on the way the amateurs handle their voltmeters and milliammeters. He says that while these instruments are designed to stand service, nevertheless they should not be used to peg at the cat. They work better if they are kept on the table permanently and not dropped on a cement floor. Mr. Miller does not favorably recommend dropping instruments around.

At the end, Mr. Maxim was called upon to polish off the evening with few well chosen brick bats, and to summarize what the speakers had said. Holy smoke, thinks I, that is some nice little chore. Suppose I were called upon to get up and undertake that job. After considering the heft of the different speakers of the evening, I allowed that I would rather he had the job. He got away with it, pointing out the desirability of amateurs trying to do better jobs in their stations. He criticised the usual amateur procedure of starting out to build a radio station at two thirty with the idea of having it ready to use at six. That hit me. It is just what most of the lads in our town do. They think it over for six months, and then some afternoon after school they decide to build. The layout is based upon what can be finished before it is too dark to see. That's one of the big troubles with Amateur Radio, Junior Grade.

The next and last session of the Convention was scheduled to be a big dinner and a general good time. Until you get acquainted with the A.R.R.L. Spirit, you do not know what this means. I had suspicions of young women in scanty attire dancing on top of tables and sitting in flolks' laps—home brew—professional brew —etc., etc. You know what some of these alleged all around good times degenerate into. There was a big crowd with clean collars and slicked back hair gathered in one of the big dining rooms at seven thirty. They looked radio to me, and as there were several ladies who looked like the wives and sisters of radio men, I thought it was good enough for me, so I sailed in with the crowd.

There was a big dinner layout, with darky waiters, music and evening clothes and things. It looked like a right smart bunch. It made you feel glad to be numbered among such a crowd. Amateur radio in St. Louis was some snooks. The game opened in regular style for these things. It was not long before they pulled another one of their gags. Yes, they pulled several. In fact, Mr. Bessey nearly got pulled all by himself. He certainly is the gay little village cut-up when he gets away from the Pacific Ocean. He is no colt, but by heck he has yet to learn what a harness feels like.

The first bout was a speech by the President after Benwood Bill had introduced him. This was short and had to do with bright young radio men. Several other distinguished gentlemen followed with short spiels about nothing in particular, and we were just getting the grub stowed where it would do the most good when Mr. Benson lost his temper. It seemed that some bone headed waiter kept slopping soup on him. It happened five times running, and as Benson had his spike tailed coat on it got his goat, and he hopped to his feet and was for dusting the place

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out with the coon. For gawdsake, thinks I to myself, here's another row. What a hair trigger lot these St. Louis folks are. Here was a first class hotel dining room, and by heck if there was not going to be a regular row right here in the room. Benson got himself all fussed up and completely red headed, and was making motions at the darky. I honestly expected a knock down and drag out was to be staged right there before our very eyes. The damwaiter talked back and seemed like he wanted to fight, too. A white man and a nigger mixing it up simply will not do where I was brought up, and race riots and police floated before my mind. They got to pushing one another, which is always the last thing before actual business begins. Then, when all seemed lost, the "waiter" burst into a tenor solo. Benson smiled, rolled down his sleeves and took his seat.



Benny is so little that we almost lost his picture, even.

Well sir, I was plumb buffaloed. The singer was a dark complected one and had been hired to pull the slop job, and Benson was as good an actor as he was. Better, in fact. The singer had a white jacket on, and blamed if you could tell him from a waiter. I certainly hand it to the St. Louis bunch. Here's mine! Take it away! It's all yours, St. Louis!

After we got our dislocated emotions back into place a lot of breezy chippies in abbreviated clothes blew in and sang, walking around among the tables and paying especial attention to Mr. Bessey. He came from the land of sunshine and flowers, so he did not repel their advances, so as you would notice it. Then a little fat man who needed a hair cut wheeled in a business that looked like a Big Bertha. He said it was a moving picture camera and that he was going to take a movie of the bunch. The machine had wheels and things, but it looked to me as though it would have to go to a blind asylum to pass for a movie camera. They all began hollering and shoving and waving their arms and napkins, and my nerves started to get on edge again, expecting some new trouble was about to squat on us. Then something exploded. There was a puff of smoke, the movie camera flew into bits, and a little girl made up like a fairy, appeared in the centre of the wreckage. The music started, and she recited a pretty little poem dedicated to the "A.R.R.L. Spirit".

This brought down the house and then Mr. Bessey announced he must sing. He explained that he had held in all evening and that the limit had been reached and that unless he got a chance to bust into song pretty damsoon, something inside him would bust open. There had been so much blowing up going on, and Bessey is so ample, it was decided to take no chances. They had a lot of the song hits of the day all printed, and arrangements were made to get Bessey's trouble off his system. We sang "Smiles", and "Tears" and "Mother" and "Mother-in-law", "Tipperary", and everything there is to sing. The more they sang, the louder they wanted to sing and the more Bessey got lit up. Things were at the top note, when Mr. Godley fell off his chair and fell against a side door and pushed it partly open. The ladies at the next table took a look, and gave a wild whoop of horror. When Godley came up for air he had the worst scared look on his face I have seen a man wear for some time. He scrambled for the door and yanked it shut and cast a guilty look around. What it was on the other side of the door that scared him so, he did not disclose. Paragon Paul ought to have told us.

Well, I'm blamed if I remember much from here on. Things got sort of blurry. There were speeches and jokes just as at one of those "down home" parties, where everybody knows everybody else and all hands have a cracking good time. Everybody loosened up. Funny! Most of us were total strangers, and yet our A.R.R.L. had brought us so close together we felt like one big family. I tell you it is simply great. It warms the cockles of your heart in a way they are seldom warmed. I've heard tell of the wonderful A.R.R.L. Spirit, but I never dreamed it was real. She is a real thing, boys, and you poor SOLs take note.

I am not just certain, owing to the noise and confuson, but I think Benwood Bill called on his Mother-in-law to make a radio speech. That shows the length to which Bill went. When a man picks on his Mother-in-law for a radio speech, he has some colossal nerve. That's Bill all over. It was a nice little speech, but the lady did not look old enough to rate the Mother-in-law rank.

The shindig ended with a few good-bye speeches which were very impressive and thrilly. Director Anthony of Muncie, Ind.,

(Continued on page 19)

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An Electrolytic Rectifier for C.W.

By P. J. Furlong, 1FF

A.R.R.L. City Manager of Boston

THE C.W. propaganda of QST during the past year is really to blame, you know. We felt that we must have a C.W. set, but could not make up our minds to come across with the spondulicks to get that motor-generator set, and besides, fashions were likely to change in transmitting tubes, and one could not tell how many volts would be correct to drape around these tubes if one wanted to be up to date and keep in the best society. Most of us decided to hang off C.W. for while, and await the discovery of some device that would drive the manufacturers of motor-generators into bankruptcy.

The electrolytic rectifier is not a new discovery by any means. Remember the time you made one up to charge your storage battery? Come now, admit it. You gave it a trial anyway, before you decided to spend twenty-eight seeds on that Tungar. Yes, I admit, it was sloppy, mussy, gassy and everything else that's punk, but don't let that make you turn up your nose and murmur: "Poor Nut", same time turning over to "Calls Heard". If you live in an apartment, where the music from the rotary is not appreciated, or the ducking of the lights, while you vainly chase that pleasing double frequency which your quenched gap is supposed to give, try this idea.

This story really started six or seven months ago. Ask any Boston amateur to describe the horrible sounds he was picking up. I did not pick 'em up, as I was very busy making them. Things have changed, however, and instead of these awful wails of agony filtering thru your receiver, there is now sweet melody and laughter. You should hear that soloist, 1FF, accompanied by 1JB on his A.C. harmonica, render that sad little ballad, "How is my A.C. hum?"

But to get at the dope, you say. Sixty cycle A.C. was first tried out about six months ago. Energy in antenna O.K. but very uncomplimentary remarks from the audience for going back on my old quenched gap. Of course no attempt at rectifying was made. Scheme No. 1 given up. Consulted experts on transformers, traveling all the way from Boston to Cambridge, to see if a frequency-changing transformer could not be doped out. Nothing doing, so Scheme No. 2 was in the discard. Self rectifier—use two tubes, get both halves of cycle and increase frequency; good idea; worked it, just exactly as Mr. Ruckelshaus describes in December QST, but I never dreamed it might be used to fone. However, the audience neglected to heterodyne me and reported very unfavorably on Scheme No. 3, which went to rest with its brothers.

About this time 1JB, a partner in crime, said it was rumored that Mr. Bussey of the General Electric Co. had succeeded in rectifying 750 volts with an electrolytic rectifier. I had done some research work in a radio laboratory, during which time many different types of rectifiers were experimented with. I became familiar with the good and bad points of the aluminum valve rectifier, but got to know the bad

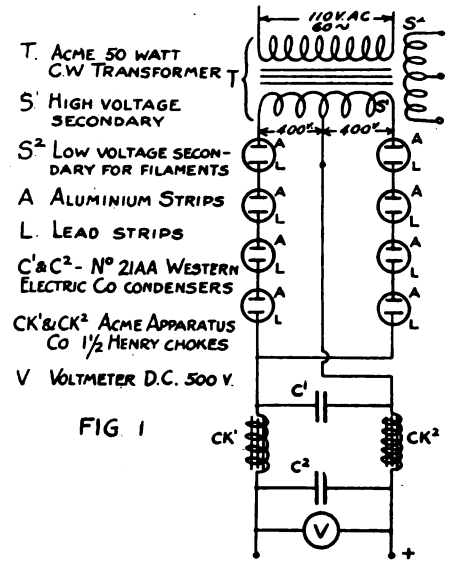


FIG. 1

ones better. However, it was decided to give the thing a trial, and once started results came along very fast. The darned thing works like a charm. I can now pound the key after ten P.M., or if I feel inclined, say sweet things to 1JB with the fone. And as for the Electric Light Co., Huh!, I snap my fingers at them, and the neighbors—they must think I have moved far far away, because the lights don't duck.

An Acme Apparatus Co. 50 Watt C.W. transformer was used throughout. It has a split secondary—410 volts to each half. The drop in voltage thru the rectifier brings this down to between 350 and 375 V. according to how much juice the filament on the transmitting tube is drawing.

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The transformer has a low voltage secondary for lighting the filament. I have used a VT-2 Western Electric tube and it works on this transformer as if they both went to the same radio school.

The rectifier consists of eight ½ pint jelly jars, of the straight variety that come with screw tops. Eight strips of aluminum and eight strips of lead will be needed; dimensions, one inch wide and about five inches long. A hole is punched or drilled in one end of each strip, which by the way are ⅛ inch thick. An aluminum strip and a lead strip are then fastened together with nut and screw, bent into an inverted-U shape, so that the lead strip will be in one jar and the aluminum in another. We have then two lots, each consisting of four jars in series. Fig. 1.

Next mix up a 2-quart vessel full of a saturated solution of borax—less than half a ten cent package of 20-Mule-Team Borax does the trick. It is important that this solution be all made up at once, in order that density in every jar will be the same. There is no critical break-down voltage, and distance between plates in jars does not seem to be of importance.

The next step to consider is the filter circuit. Fig. 1 also makes this clear, I think—two Acme 1½-henry chokes and two 1-mfd. Western Electric Co. condensers, No. 21-AA, tested to 1000 volts.

The filtering of the output from this type of rectifier seems to be a much easier job than that of a tube rectifier. A D.C. 500-volt meter put across output of rectifier reads 375 volts and no flickering of hand on meter. Tube rectifier throws the hand up and down over 50 volts unless carefully balanced with filament rheostats on rectifier tubes.

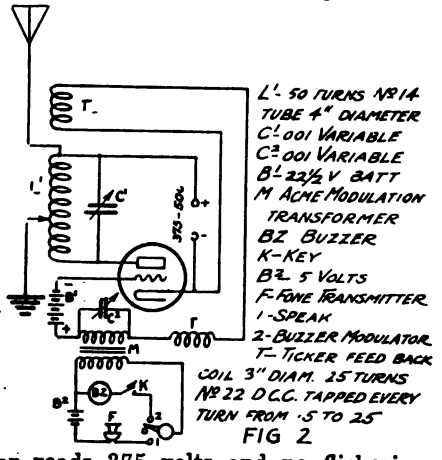


FIG 2

The rectifier was put in commission two weeks ago, and has run about four hours every night, has needed absolutely no attention so far, and positively does not heat up. The transformer, rectifier and filter are in a small box under the table, where they take up less room than the smallest motor-generator set.

At the present time I am using a Colpitts circuit and Heising modulation (see pages 6 and 7 of May QST). I get good results with grid modulation, tho I very much prefer the Heising. The only disadvantage of this circuit is that the drop in voltage, due to extra load of modulator tube, pulls the voltage down to 250.

1JB, who worked with me on this dope, gets 0.6 to 0.7 amps antenna current and has worked about 30 miles, grid modulation and one VT-2. 1BAY—well, see October and November "Calls Heard" for his distance. 1KBE has motor-generator and this rectifying stunt. He can change from one source of current to the other, and at two miles I can find no difference.

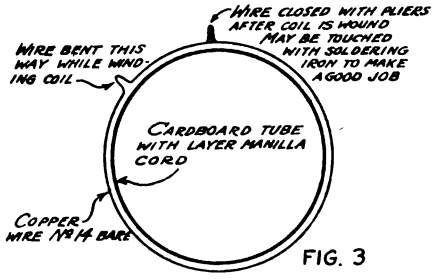


FIG. 3

A few hints, I suppose, will be in order. When the rectifier is first used it will be noticed that the transformer secondary heats up badly. This is natural, as the rectifier is a dead short circuit. Pull your switch and allow transformer to cool off. It will take about 15 or 20 minutes to get the coating of aluminum oxide on the aluminum plates. This is called "forming the plates". Once they are formed no further trouble from heating will be experienced.

If the plates are placed in the order shown in Fig. 1, the tap from center of secondary will be positive, not negative as is marked on the transformer. A change in the order of plates will reverse polarity, of course.

While the little 50-watt transformer is entirely satisfactory, it would be better to use a separate transformer to heat the transmitting tube filament. Any change in load on the high voltage secondary will affect the output of the filament secondary, and this will not be any too good for filaments if using anywhere near maximum current while tube is oscillating. This applies particularly when key is used in ground lead for straight C.W.

Don't throw your high voltage on until you have filaments lighted up. This favors the separate transformer for filament heating.

(Concluded on page 28)

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The Washington's Birthday Relay

AS announced in last QST, Mr. W. H. Kirwan (mail address, Box 148, Davenport, Iowa), old 9XE, is arranging for a nation-wide relay on the night of February 21st with the co-operation of the A.R.R.L. Operating Department.

This will be a brand-new idea in relays —the transmission of a 30-word message from President-Elect W. G. Harding, addressed to all governors and mayors, which is to be copied by every amateur and delivered to his proper local official. The messages will be so routed that they will be receivable in every part of the country, and everybody can get in on it. If we do the job well, we will make a splendid demonstration of the value of amateur radio to the community.

The message is to be split into three sections and started in different parts of the country. At 8:10 p.m. Eastern Standard Time, Feb. 21st, 1AW at Hartford will start one section which will move to the west coast via both the northern and the southern routes, and will consist of the 2d, 4th, 6th, 8th, 10th, 12th, 14th, 16th, 18th, 20th, 22d, 24th, 26th and 28th words of the message. At 8:10 p.m. Pacific Standard Time, Feb. 21st, 7ZB, Vancouver, Wash., and 6ZK, Sunnyvale, Cal., will simultaneously transmit another section consisting of the 1st, 3d, 5th, 7th, 9th, 11th, 13th, 15th, 17th, 19th, 21st, 23d, 25th, and 27th words of the message, which will be relayed across the country. The remaining words, the 29th and 30th, will be broadcasted to QST at 10 p.m. Central Standard Time, Feb. 21st, by 9BY, Rock Island, Ill., using 4 amperes of C.W. energy on 200 meters. 9BY's C.W. set should be heard over a radius of 1000 miles, but the third section transmitted by it will be taken up and relayed to both coasts by the regular trunk lines.

Provisions will be made to get the message to every part of the country and to safeguard against failure. As soon as the main relay clears a division, Division Managers will start that section thru the short-jump routes on low power for the benefit of the small stations that cannot receive long distances. At 9, 10, 11, and 12 p.m., Central Standard Time, 9BY will QST such parts of the message as have been received by it, on 200 meters C.W., and 8XK will also be asked to repeat the sections as received. NSF will repeat the sections received by it, but only on schedule, which schedule will be broadcasted and relayed over the trunk lines during February. At 12 midnight 9ZN, NSF, and 8XK will broadcast the complete message. Additional particulars will be transmitted by 9ZN during February; 9BY will make an announcement by radiophone every night starting Feb. 1st at 8:15 p.m.; and 9ZS, Springfield, Ill., will broadcast information every night after time signals.

In the event strays or "dead" conditions make it impossible to get the relay across the Rockies on the 21st, it will be tried again at the same times on the night of the 22d.

This is going to be a hard relay and will thoroughly test our ability. The idea is to collect the sections, piece out the complete message, write it in ink or typewriter on an A.R.R.L. message blank, noting the time and station from which received, and deliver at the first possible moment to the governor of your state, the mayor of your city, or the highest local official (even if he's only the town constable), securing his receipt, and reporting all particulars to Mr. Kirwan. Many prizes in apparatus are being secured and will be awarded the stations who do the best jobs. The contest is open to everyone.

We all know what to do to make this a success—the same things are necessary as in all our other undertakings: cordial co-operation, the reduction of QRM by the elimination of all unnecessary transmitting, and the resolution that we are going to put it across in typical A.R.R.L. style. So tune up the old set, fellows, get a few A.R.R.L. blanks handy, and be ready for one of the biggest amateur events in years.

ROTTEN S.O.L.

(Continued from page 16)

made an especially good speech. So did Brother Warner and Mr. Stewart and Mr. Bessey, who had calmed down by this time. The last one was by The Old Chief himself and I will say he impressed us all. He made it stick out a foot that CITIZEN RADIO, as he likes to call it, is a dignified thing. He drew a picture of the future that held us for fifteen interesting minutes. It capped the job in good shape, and when he finished and said his "Good Bye, St. Louis", we all felt as though we had been to church and had listened to a good sermon. I'm not strong on sermons, but just the same I have heard one or two cracker jacks in my time, and they always leave a nice taste in the mouth. That was the way we felt as the closing scenes of the St. Louis Convention were enacted.

It seemed too darned bad to have to break up. I say once more, I had the daggondest best time I have had in twenty

(Concluded on page 23)

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Transatlantic Sending Tests

MANY of our readers have no doubt read in Everyday Engineering Magazine of the transatlantic sending tests arranged by that magazine to take place the first week in February, with numerous English amateurs preparing to listen in on the other side. Everyday Engineering very unfortunately has been obliged to suspend publication, and its radio department editor, Mr. M. B. Sleeper, has asked the A.R.R.L. to take over the tests and see them thru.

Our Operating Department has been glad to do this, for the good of Amateur Radio and in order that Mr. Sleeper's excellent idea for the first transatlantic tests may not be wasted. Arrangements have not been completed fully at this writing and it is impossible to give schedules, etc., but the plans of Mr. Sleeper will be followed with as little change as possible, the American entrants probably transmitting on schedule on the nights of Feb. 1st, 3d, and 5th.

It is regretted that many of our A#1 eastern spark stations have been unable to enter the contest and at this late date it is probably impossible to secure any more entrants. It would have been extremely interesting to see what success these stations would have, as we believe their chances would have been better than those of the majority of the entrants who contemplated the building of special tube sets for the tests. While we are very hopeful that at least one of the entrants will be heard overseas, the British amateurs have not had the practical experience in short wave reception that we have benefitted by over the past ten years, and so they are working under more or less of a handicap. Fortunately, however, the average British experimenter is more of an engineer than an amateur, and they have a way over there of going into such things in a most painstaking fashion, so that we may expect that a number of them will have built sets and multi-stage amplifiers especially for these tests. We are pleased to note that the general trend of design in amplifiers for this purpose seems to be the use of tuned inter-stage circuits for amplifying the radio-frequency, and except by the use of the Armstrong super-autodyne, we do not see how the amplifying arrangement could be improved. The tests are to be 200 meters, and as they have QRM from a British navy wave length of 214 meters, their amplifiers will be sharply tuned at 200 meters, so that our transmitting stations will have to be tuned to within a meter or two of this wave length. Altho a hard job, it will give some excellent practice in the absolute obedience of the radio law, and it will have to be done if our signals are to be heard by the British stations.

The arrangements in England are in the hands of Mr. Philip R. Coursey, Assistant Editor of "The Radio Review", London. We expect to have a report on the outcome of the tests from Mr. Coursey in our next number. If they are successful, we hope that arrangements can be made for the relaying of amateur traffic to England on schedule, and at the very least they should have inspired the British amateurs with the ambition to persist until finally they succeed in copying the American amateurs.



Miss Ham gives permission, via radio, for a nearby amateur to call on her. She has never seen him and now it looks as if others had been listening in also.

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Some Whys, and Speculation as to Some Possible Wherefores

By M. B. West*

Mr. West needs no introduction to our readers. His practical articles we count among our best contributions. Here is another kind of article—one designed to make you think about the immense possibilities for improvement in design which exist in our spark transmitters. What have you to say about his ideas?—Editor.

MY curiosity is aroused as to the possible explanation, in simple terms, of the widely different behavior of different transmitting stations. Why, for instance, does some well tuned station with an antenna current of six amperes have a range of only a few miles and another station almost identical in construction, with an antenna current of two or two and one half amperes, work over half the continent? Why is it that an antenna will work very much better both as to radiation, decrement and signal strength at one certain wave length (usually about twice the natural period but differing in every case in its relation to the natural period, depending seemingly on its type, the number of wires and its surroundings)?

We have been told often and again of the advantage of "saving up" our one K.W. and letting it out in "chunks", and of the tremendous values of current which flow in the antenna when the maximum instantaneous value is considered. And some of us have developed our transmitters until these values, mathematically considered, rise to tremendous values. And then along comes some one with a little "insignificant" antenna, a few tubes, and other "junk", and with an input of fifty or sixty watts and an antenna current of less than one ampere, works across the Atlantic.

Stop and think a minute. With the spark transmitter, you save up that one K.W. and let it out in "chunks" so that the actual rate of discharge may reach 100 K.W. or more. The current flowing in the antenna as measured on the meter is only an average value and the maximum instantaneous value may reach, in an amateur transmitter, the surprising value of 7,000 or 8,000 amperes. The voltage on the antenna reaches surprising potentials. All of these should result in a considerable disturbance of the ether, and generally do.

However, with the C.W. transmitter, our output is constant with the input. There is no such thing as saving it up. Radiation as shown by the ammeter is the average value of the alternations and represents the same relation to the maximum value as in ordinary alternating current. Potential is low. And not all of the energy received at the distant station is useful, as in heterodyne reception only those waves that add to or oppose the waves set up in the receiver actually are useful in producing the signal.

So it seems to me we have material enough for a pretty big WHY. To me, at least, even considering the reasons ordinarily given, there is a discrepancy that will require more than ordinary explaining.

Mr. Alexanderson, in an account of his recent address to the members of the Institute of Radio Engineers, made several references to "power factor" which to say the least aroused my curiosity as to its probable effect in radio frequency circuits. As a result I was soon thinking "power factor", reading "power factor", and mighty soon talking "power factor" to any one that would listen. Read up on it yourself. Even tho it may have little bearing on radio problems you will find it a very interesting subject to speculate about.

Power factor or phase displacement is to me best explained by first considering the case of a condenser. When a condenser is connected to a source of direct current there is instantly a tremendous rush of current into the condenser which quickly dies down to zero as the potential across the condenser rises to that of the D.C. supply. This in effect results in the current preceding the potential and when the condenser is connected to a source of alternating current the amperes do flow into it before the volts and we have phase displacement, and actually current flowing in a positive direction while there is a negative potential! But as the power in the circuits is measured as watts, which are the volts times the amperes at a given instant, the actual power is very much less than the number of amperes would indicate. And as any losses that occur in such a circuit are usually current losses, these excessive current values cause a correspondingly greater proportion of loss than if the volts and amperes were together and so could simply be multiplied to determine the power in the circuit.

Now consider a large coil of wire wrapped around an iron core. Connect

*Pre-war 8AEZ; member A.R.R.L. Advisory Technical Committee.

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this to a source of dirrect current and we find that the greatest current does not flow at once, as there is a counter electromotive force generated by the coil which opposes the flow of current until the core is fully magnetized. Connect this coil to a source of alternating current and we find the amperes lagging behind the volts and as in the case of the condenser we will have to have a considerably greater current or potential than would seem to be necessary in order to transmit that amount of power thru the coil. Again the volts and amperes do not come at the same time, but this time the amperes are coming later.

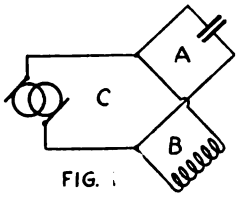


FIG. 1

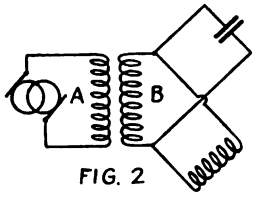


FIG. 2

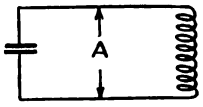


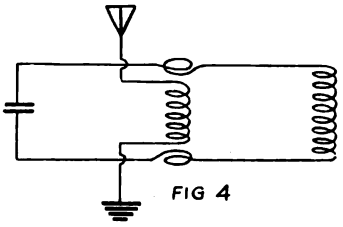
FIG. 3

If we should connect a condenser and coil together in the same circuit and properly proportion the capacity of the condenser to the inductance of the coil we could exactly balance one against the other so that the tendency of the current to lead in the case of the condenser alone would be neutralized by the tendency to lag in case of the coil alone, and the result would be that we would transmit our power thru such a circuit with losses occasioned only by the resistance of the conductors and dielectric.

In all radio circuits we have both inductance and capacity but it is seldom likely that they are so balanced as to produce ideal conditions. In fact it seems that no attempt at all is made to balance them. Should, as may easily be the case, these values be so combined as to give a very low power factor, this may account for the amazing values of current that are sometimes encountered, and for such large proportions of loss as seem to take place.

When we consider various combinations of inductance and capacity in branch circuits we find the problem still more complicated. In Figure 1 we have a source of alternating current supplying two branch circuits. If we measure the power factor a A we find it very low, with current leading. If we measure it at B we find it also very low but with current lagging. But if we measure it at C we find the power factor high, depending on the resultant of the two values of capacity and inductance. Now if we add a transformer as in Figure 2 (disregarding resistance and supposing a "perfect" transformer) we will find the power factor measured at A and B to be the same, still being a resultant of the values in the two branches. In consequence it would seem that if two circuits are coupled together by a transformer, each circuit having different values of capacity and inductance, we would have a variety of power factors at various points in such an arrangement but should be able to find a point in which the power factor would be that resulting from all factors combined.

Now take Figure 3 as representing the values of capacity and inductance in an ordinary closed circuit. Consider it as energized and high frequency current flowing. If we measure the power factor at the condenser we should find it very low with current leading. If we measure it at the inductance we should find it very low with the current lagging. But might it not be possible that if we measured it at some intermediate point, such as A, we would find the resultant of the two and get a point where if power were taken from the circuit the volts and amperes would be in phase? Why not at this point insert a turn in each side of the circuit, wound in opposite directions, and from these turns transfer our energy to the


FIG 4

antenna? See Figure 4 . Of course these turns will have inductance and their effect will be additive but their proportion to the whole need not be large and they could be nearer to the condenser.

But we have introduced other factors. We have coupled this circuit to another which in turn has other values of inductance and capacity, and which predominates. If we could distribute these values equally throughout the antenna system, we would have the same power factor at all points and if we could balance the factors we could secure a power factor of unity at all points. As that portion nearest the ground would seem to have the greatest capacity per foot of wire we could bring our wires close together near the ground and spread

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them apart as they rise from the ground, and so to some extent at least distribute the capacity uniformly. If inductance is lacking we might coil the whole antenna and by properly spacing the turns distribute the inductance also, of course using such turns as are necessary for the proper degree of coupling.

Of course the above is pure speculation. But think a moment. Suppose we consider a transmitter as a piece of apparatus the output of which in watts is constant. If the power factor is near unity these watts will represent very low values of potential and current, but considering resonance effects, if the power factor is very low, especially at different points in the circuit, we will have tremendous values of current and potential with correspondingly greater losses. It is power that makes the distant signal, and watts are what represent it. It would seem therefore that it would be of importance to secure as low a power factor as possible in such parts of the apparatus as really transfer the energy. And at least to some extent we have the inductance and capacity under our control.

While the above does not explain any of the questions outlined in the beginning, it does in some particulars seem to point to a possible explanation and to me it has seemed extremely interesting. Its purpose is to make you think.

It is not my intention to put forth any new theory. Technically there are no doubt serious errors in the conclusions drawn. But it would seem that some explanation is about due for the very great differences in results attained. Perhaps some discussion will result which will at least help solve these problems.

TRANSCON RECORD SMASHED!

As QST goes to press we have the glorious news that our A.R.R.L. has broken the transcontinental relay record by handling a message from Hartford to Los Angeles and return in 6½ minutes. Complete details of this and the other Transcons will be in March QST. It is radio history. Don't miss it.

2ZM'S RADIOPHONE—C.W. TRANSMITTER

(Concluded from page 8)

freely and over a comparatively wide range.

OPERATION—Drum switch at point O or neutral position opens all circuits. At point 1 to left connects antenna to receiving set, still leaving all circuits open. At point 1 to right connects antenna to transmitter, closes filament and high voltage circuits, and connects two tubes as oscillators and two tubes as modulators, and is the position for either phone or buzzer transmission, either of which can

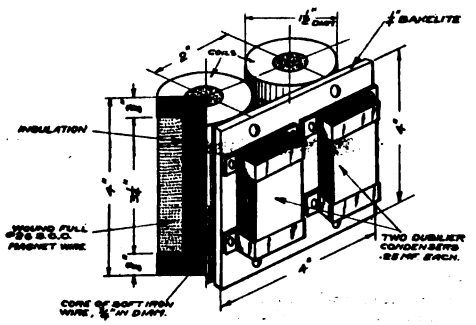


Fig. 7.

be used by changing SPDT switch to left for phone and to right for buzzer. At point 2 to right, still closes antenna, filament and high voltage circuits and connects all four tubes in parallel as oscillators for C.W. transmission, which may be sent out by inserting a few turns shunted by a key in the antenna circuit as shown in Fig. 4. The current for both the buzzer and transmitter is supplied from the filament battery through a proper resistance as shown in diagram.

ROTTEN S.O.L.

(Concluded from page 19)

years. If this is what a Radio Convention is, I am for them. It is to be more conventions and less useless apparatus for me in future. You stick-at-homes, who never saw a Radio Convention, you are S O L all right. You St. Louis boys, here's to you! We all love you and hope to see you again. May your sigs never fade and may you live long and may you and yours always prosper!

T.O.M.

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The Autobiography of a Message

By Robert S. Quimby 1AAG

Here is a story with a moral. All of us have heard perfectly good messages accorded exactly the treatment that befell the one in this story. Let us take this matter a little more to heart, fellows, and exercise the gray matter in routing our traffic.—Editor.

I WAS born, December 12th, in a town not far from Boston, and christened Msg. Nr. 13. Rather an unlucky name, thought I, as I found myself coming into being under the pencil of my creator, who was soon to send me on a journey to his friend in the city of Blank, N. Y., whom he had not seen for many moons. But no more unlucky was I than many, many more messages with whom I afterwards made acquaintance, having all met with the same misfortune.

For all my name seemed so unlucky, I was happy. Happy because I was to perform a very useful duty; that of informing my writer's friend that he, the writer, would be down to spend the holidays with him. Surely I was to be of great service in this world.

Soon after I was completed I was started on my journey. I had no fear of getting lost, since the trip was only about four hundred miles and the boat in which I was to cross the etherial sea, tho small, was sturdy and of full 1 K.W. power. My happiness knew no bounds now, for I was sure of a good start and a fast journey to my destination. For a while I was sure my thoughts had been correct, for, altho it was not the kind of night generally considered best for long distance transmission, by the aid of my powerful motor and favored by a calm sea I was soon laid gently onto the antenna of a station located in western Massachusetts.

After passing thru an endless lot of wires and what not, I at last found my way to the 'phones and whispered my message to the operator. Great was my joy to find he heard me and understood my importance. For he was at that moment pounding his key to the effect that he would get me off as soon as possible.

He did! In fact he got me off just a little too soon, for had he stopped to consider, at least some of my misfortunes never would have come to pass. But as he listened to the GN of my creator, he was suddenly attracted by the calling of some far-off station. What was it they were saying? He began to manipulate the knobs on the front of the box thru which I had just come. At last he had them tuned in and he listened to the soft clear note calling, "CQ CQ de 2XYZ QTC?"

At this point my joy came to a sudden end as I heard him say, "2XYZ; Hm! Wonder who he is." (Goes to call book looks up 2XYZ) "Ah! New York City—don't know where the city of Blank is but 2XYZ is a good two hundred miles away and if I can make him on my ¼ K.W. it will be something to talk about." At this point he heard his own call being sent by a station about a hundred miles from him in a north westerly direction and with whom he had often talked. This station was also asking "QTC?". For a moment my hopes rose. Perhaps, thought I, he will stop and see where the city of Blank is and then give me to this station.

But no. The lure of long distance held him in its power. Without stopping to look up the location of the city of Blank he immediately called the station he had heard last and sent "QRU OM GN". Then began the struggle for fame. "2XYZ 2XYZ de 1ZYX," sang the spark, time after time, but with no answer. Finally I was laid aside, while other messages of less importance were sent to various nearby stations.

After several hours of waiting I suddenly heard the spark calling 2XYZ again. This time there was an answer. I watched the face of my guardian glow with pride as he realized he had got thru to New York City. But as his joy increased so did my gloom as I heard him say "Hr msg for NY OM", and then felt myself lifted from the hook as he received the QRV, and realized I would soon be speeding to New York City, some two hundred miles in the wrong direction. I began to wonder where I would be sent next.

By this time I had arrived at the station of 2XYZ; a nice cozy place it was, too. But what interested me most was a large map hung near the set. "Now", thought I, "I should at least be sent in the right direction". But as it was early in the morning my new guardian was about to turn in for a few hours sleep before going to work at 7:30. (How they do it is beyond me.)

On the next night I was once more started on my journey, but the sea was rough (my sender called it QRM) so I got but a short distance that night; tho thanks to my guardian, who had taken the pains

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to look up the town of Blank on the map I had noticed, I was now headed in the right direction. The next couple of nights were the same. I began to get worried lest I should arrive too late and thus be of no use. It was terrible to think of after what I had already been through.

On the fifth night, however, the storm subsided, and I went sailing away to a town only ten miles from my final destination. My mind was at last relieved. Ten miles! and three days left before my creator would leave to visit his friend. Surely I would be in time now. My joy was suddenly quelled, however, as time after time my new guardian tried to get me through to different stations located in the city of Blank. Every time the story came back, "Sorri OM, QRM, cant make it now, CUL, GN". I was finally put up on the hook where I stayed 'til the next night.

On the next night my guardian again tried to get through the storm but with no better luck. At last in desperation he called the nearest station to him and sent me on my way. Great Guns! I was worse off than before. I was now fifteen miles from the city of Blank. All evening the storm raged and I was tossed around from town to town, always keeping a good fifteen miles away from my goal. Finally when the night wore on I was put up on a hook with a number of other messages.

How long I stayed thre I never knew, having lost consciousness from grief as the next night came and went and I realized I could be of no use in this world of wireless. When I came to, I was aware that someone was talking about me. Finally I made it out. My last guardian had raised the station which was to be my destination. What I heard filled me with horror. It was just this:

"Yes OM have msg for you", (at this point I was lifted from the hook and sent to the station at Blank). At last I had arrived at my destination! My receiver was now pounding the key and I caught the words "Thanks OM, but I guess its a little late as my friend has gone back after spending two days, and all his money, at the Hotel. We didn't expect him so couldn't put him up here GN OM CUL".

And with that I was crushed in strong hands and roughly thrown into the waste basket.

A Simple Wavemeter for Use with Oscillating Circuits

By Allen H. Wood, Jr.

THE proposition of getting a wave meter to calibrate long wave CW receiving sets has been somewhat of a problem to the average amateur for a long time. They can of course be purchased but the price is prohibitive in most instances. Then, too, the wavemeters of this type offered on the market are complicated and employ vacuum tubes for circuit driving or other arrangements which necessitate critical adjustment before the meter can be used.

A wave meter is a very useful addition to any station and especially so where a long wave set is in operation. The foreign arc stations and some of those in our own country have a distracting habit of sending for hour after hour without signing off or giving any indication of who they are. When an enthusiast is trying out a world beating circuit and hears a distant station in operation whom he thinks is China, it usually gets his angora not to be able to check up the station he is hearing. If a fairly accurate wave meter is used and the wave length of the incoming signals is noted, it is easy to form a pretty definite idea as to who is sending. This is especially true of the foreign stations whose wave lengths vary enough to limit the guess work almost to a certainty. The very simple wave meter described below can be calibrated easily, either by a radio company or by the maker himself without much trouble. Its low cost and ease of operation make it a desirable instrument for every amateur. It should be clearly understood that this wave meter will function only on OSCILLATING CIRCUITS, inasmuch as it does not generate its own oscillations.

The apparatus necessary is simply a capacity and an inductance. The capacity should be a variable condenser of .001 mfd. maximum capacity. The Clapp-Eastham balanced condenser is recommended in this instance as it is of low resistance and has an unusually straight capacity curve. Figure 3 illustrates the capacity curve of the CE-Y800A condenser. The inductance should be compact and have about 125 m.h. L which, in conjunction with an .001 capacity, gives a wave length range of 5500-19000 meters. This will include practically all of the long wave stations in operation today except XDA and one or two ship installations. A suitable cabinet with a bakelite top should be obtained and the capacity and inductance mounted. Details are omitted from this article regarding

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mounting as every amateur has some particular method of assembling his apparatus. All the wiring necessary is to shunt the condenser across the coil and the wave meter is ready for calibration.

Any of the companies who manufacture radio apparatus will calibrate the meter

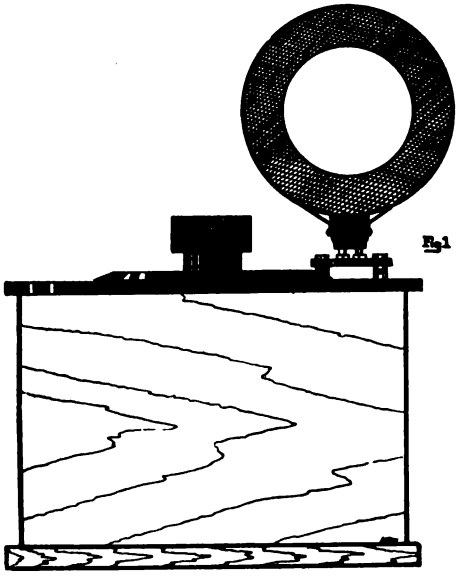


Fig 1

for three of four dollars, or the calibration may be fairly accurately plotted by the maker by the following procedure. Start at 10 degrees on the capacity chart in figuring, not at 0 degrees, as at this point the added capacity of the condenser is of the same order as the distributed capacity of the coil and calculations are very uncertain at the best. Obtain a standard LC chart of which there is a copy in nearly every book on Radio Telegraphy. The units which we shall use are microhenries and microfarads. Multiply the capacity found at 10 degrees by the inductance of the coil and refer to the LC chart.

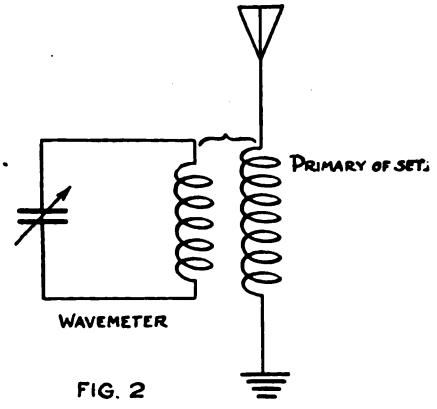


FIG. 2

Suppose we find our product to be 8.67. We find the wave length directly indicated as 5550 meters. If a standard LC chart is not available the same results may be obtained by the following formula:

$$\lambda = 1885 \sqrt{LC}.$$

Let us go on another step. Referring to the capacity chart we take the capacity at 20 degrees. Multiplying this by the inductance of the coil, we find say 15.83. Looking at our LC chart we find this indicates a wave length of 7500 meters, etc. By this method the wave meter can be calibrated to within about a hundred meters of accuracy, which is close enough for long wave work.

The method of using the wavemeter is simplicity itself. Bring the inductance of the wave meter into the field of the primary coil of the set and move the condenser on the meter back and forth. When the two circuits are resonant there will be a click or a squeal in the phones depending upon how fast the operator goes past the point of resonance. If the set incorporates a galvanometer in the plate circuit the resonant point is clearly indicated by the flickering of the needle. No changes are necessary in the receiving set in order to use this wave meter. Simply put the set in operation as usual and when you hear

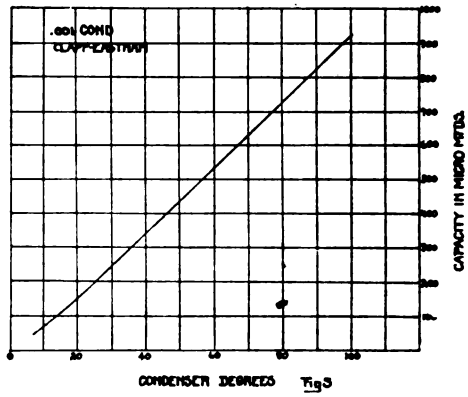


Fig 3

a station of doubtful origin whose wave length you want to know, bring the wave meter in the field of the primary coil, adjust the condenser and read the wave length on the chart. This is further shown in Figure 2. Figure 1 shows one form of this wave meter which is doing excellent work in the writer's laboratory.

(Note: The use of the wave meter in this manner forms the so-called sensitizing circuit for long wave reception as described in QST for October, 1919, page 3, and will by itself increase signal strength several fold.

It will doubtless occur to the constructor to make use of a standard Universal-wound coil for the necessary inductance.—Editor.)

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Amplifying Bulbs

By A. E. Harper

SINCE the termination of the European War a number of foreign bulbs have turned up in this country, obtained in various rather peculiar ways, which have constants unfitting them for use with circuits designed for American tubes. While in the army the author was given the opportunity to test some of these bulbs and collected some data which may be of service to radio men who have possessed themselves of foreign made tubes.

Before considering any specific type of bulb let us review for a moment the properties that all amplifying tubes have in common. The amplifying power of a tube depends on the change of plate current in amperes produced by a change of unit volts in the grid potential. This constant is called the mutual conductance of the bulb. It may easily be seen in Fig. 1 that a change in grid voltage of dE_g will produce a change in plate current of dI_p. The mutual conductance is obtained from the equation

$$\frac{dI_p}{dE_g} = G_m \qquad (1)$$

To calculate this constant it is only necessary to take two points on the straight portion of the characteristic curve, find the difference in voltage and the corresponding difference of plate current in amperes, and divide. The bulb having the highest mutual conductance is the best amplifier

This constant is connected to the other tube constants by the equation

$$G_m = \frac{k}{R} \qquad (2)$$

where k is the constant of voltage amplification, and R is the internal resistance of the tube.

Some idea of the characteristics of a bulb may be gained from an inspection of the elements. A bulb which has a very fine grid, or a very small spacing between the grid and the filament, will usually have a high constant of voltage amplification. The reason for this is the fact that the electrons gain in velocity as they approach the plate. If the grid is near the filament it controls the flow of electrons before they gain a high velocity and therefore produces larger changes in plate potential.

The internal plate resistance also may be estimated by inspection of the elements. If the plate is large and near the filament, the resistance of the bulb will be low; however, it must not be too near because the ratio of plate-filament distance to grid-filament distance must be kept great in order to give the tube a high constant of voltage amplification.

From inspection of the table it will be seen that the American-made bulbs lead the world. Probably the best tube obtainable is the Western Electric VT-1, or Type J as it is called by the makers. Its mutual conductance is .0005, more than twice as high as any other bulb. In addition to its high amplifying power it only requires 2.2 volts filament. The most economical way to use these tubes is to place two in series on a six volt battery. This combination saves the power that usually is lost in the rheostat. Less power is consumed in lighting two of these tubes than is used in one Marconi bulb.

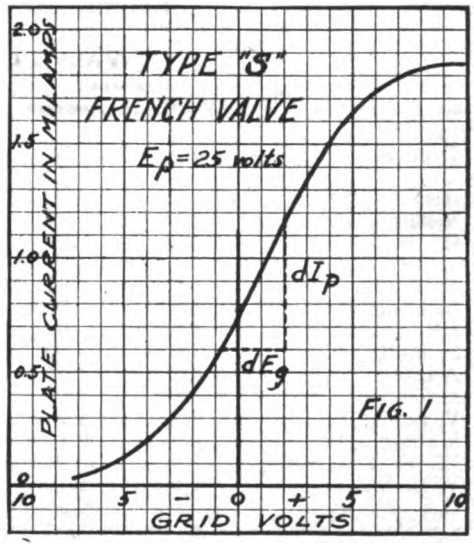


FIG. 1

The W. E. telephone amplifying tube is probably superior to the type J, but it has several disadvantages. It is hard to obtain, it requires 250 volts on the plate while the J tube operates best on 40 and uses more power in the filament.

The French bulb is the most important of all the foreign tubes because all the others are copies of it. The French caught the standardization bug from the United States and designed their type S tube to operate as a detector, amplifier or generator. Its characteristics are practically the same as those of the Marconi bulb. It was used as a detector on 24 volts, as an amplifier on 60 volts, and as a generator on 400 volts.

The Germans used another method in producing their tubes. They captured a

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number of French valves, redesigned them for special uses, and improved them not at all. Almost a dozen types of tubes were found on the battle field, all bearing signs of having a common French ancestor. A special type was used as a detector for spark sets, another type was used for receiving undamped signals, while still another kind of tube was used to amplify. The best valves they had were the A.E.G. amplifier, and the R.E. 16 continuous wave detector. A number of tubes captured could not be tested because they were burnt out or the glass was broken.

The British bulbs in the early part of the war were very poor. Recently some very excellent tubes have been developed, but the data on these tubes is not at present available. Capt. Round has designed a bulb for radio frequency amplification at low wave lengths which has a very low grid capacity.

C.W. sets are so popular now that this article would not be complete without some mention of VT-2 and VT-18. VT-2 is made by the Western Electric Co. for low power transmitting sets. It produces about 4 watts of oscillating energy. The General Electric VT-18 is a high power tube, putting 40 watts into the aerial.

VALVE CONSTANTS

Name	Filament Volts	Filament Amperes	Plate Volts	Plate Resistance	Mutual Conductance	
French						
Type S	4.0	.70	24	24,000	.0002	Det Amp Gen
British						
V-24	4.0	.67	65	54,000	.00018	Amp
Q	4.0	.30	50	200,000	.0001	Det
German						
EVE-173	4.2	.62	65	40,000	.00015	Det
Sedding	4.0	.70	65	40,000	.0002	Det
RE-16	4.0	.62	65	24,000	.0002	CW
S. & H.	3.0	.50	70	60,000	.0001	Amp
A.E.G.	3.2	.56	75	35,000	.0003	Amp
American						
W.E. VT-1	2.2	1.1	60	20,000	.0005	Amp
Marconi II	4.0	0.7	60	35,000	.0002	Amp
W. E. Telephone	7.0		250	4,000	.0015	Amp
W.E. VT-2	7.0	1.36	300	5,000	.0014	Gen
G.E. VT-18	10.0	6.50	800	50,000	.0002	Gen

Det = Spark detector CW = undamped detector Amp = Amplifier Gen = Generator

AN ELECTROLYTIC RECTIFIER

(Concluded from page 18)

If you don't possess a milliammeter, use a 3-volt flashlight bulb in your plate circuit. If tube does not oscillate readily, be careful to watch tube, as well as flashlight bulb. Tubes can heat up to such a degree that all the elements will collapse.

The inductance L' was quite a problem to produce cheaply. Cardboard tube 3¾" diameter, shellaced, and when tacky wind full with large chalk line or good manila cord. Let this stand over night. In the grooves then wind on No. 14 bare wire, 50 turns, tapping every turn after 15th. The cord keeps the turns separated. To take off taps, bend wire as in Fig. 3, leaving bend about ¼ inch open; when winding is finished and end of wire is securely fastened, these bends or loops should be closed with pliers, and as an extra precaution they may have a little solder. Closing the bends results in a very tightly wound, good looking coil, which is easy to handle.

Don't think you are going to improve matters by cutting out some of the rectifier jars. If you don't like their line-up, add more jars. Don't skimp on the filter circuit, either; a few more condensers will improve it.

Should any further information be desired on this rectifier the writer will be only too glad to let anyone dropping a line have same.

DON'T YOU WANT TO JOIN THE A.R.R.L.?

Any member of the Operating Department personnel will gladly take your application and acquaint you with our activities in your section. A bona-fide interest in Amateur Radio is your only requirement for membership. Ask your District Superintendent for an application blank, and become a member of an organization that DOES THINGS.

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Are We Appreciative?

ARE we—of the wonderful privileges which we American citizens have under the law which permits us to practice amateur radio? You will answer a careless "Yes", but are we? Do you know that this is the only country on the whole wide globe where citizens can engage in radio to anything like a reasonable extent? Consider Canada with its 50 meters, Britain with its 10 watts and restricted aerials, France with its ban on everything except meteorological information, Germany with its absolute "verboten". In this land of the free we have the glorious privilege of operating undisturbed in our little domain if we comply with certain simple requirements—but how many of us comply? All too few, fellows, and it is therein that we say we are not properly appreciative, for if we were we would rigidly live up to the spirit of the wave length and decrement law.

Because a Republican Congress did not give a Democratic administration enough funds to fully enforce the radio laws, we have been allowed to drift. And in drifting we have unconsciously taken a few meters here, a few there, until today the average amateur tune will be found many meters above the legal 200. Men, if the law were enforced as it should be, over 90 percent of you would be shut down at once, and many of you with too-long aerials could not reopen until considerable rebuilding had been done. Of the general amateur stations we hear here, we should say that less than 10 percent are within the legal 200 meters. Is this appreciative? It is not—it is carelessness, and it must be stopped before we get into trouble.

Fellows, the wave length **must go down.** 200 meters is your limit. Get down there and stay there. Don't think that this is something that we're printing for the other fellow—that it doesn't apply to you. It does—if you are an average amateur. Your wave is too long and it's YOU to whom we are talking. YOU must realize that this is a thing that YOU are responsible for and that YOU alone can remedy as far as your own station goes. For the good name of Amateur Radio it is up to YOU to get busy at once and get your wave down to 200. The A.R.R.L. expects every man to do his duty in this important matter.

False Calls vs. Bum Fists

EITHER a considerable number of bums in our midst are maliciously signing false call letters or a considerable number of fists are so bum that the calls "ain't what they useter be". The result is the same, and it's causing lots of perplexity as to who hears whom and why not.

Recently we told of our desire to meet up with a certain gink who delighted himself by signing 7HH. Was it really this or was it a rotten fist? Gawdnose. We can cite other instances: 3AH was copied by 4DL while he was out of town, and again by 9FG while he was in bed, again by 1OE and 8AL at other times when the little squeak box was idle. Consider the bird near Boston who calls various DX men and signs 9ZN, thinking that because his antenna is not connected no one hears him. Does he like the roll in the ZN so much better than his own call? 9ZL reports 2EN in December and 2EN's range, when he stopped operating three months ago, was three miles. Who is the gent who has appropriated Don W. Moore's call of 4CJ and has been reported by 4DY, 4AM, 8IZ, 1BG and 9AIT? Who is the 1HBA near Montclair, N. J., where respectable "1" calls have no business straying? Who is the 7AQ that friend Groves down in Virginia heard calling 7AD?

Judging by the number of calls we can't read at all, and some horribly mutilated ones that we just happen to know, it is not surprising that some signals should be reported in places where they could not reach. We must watch this, fellow amateurs, or the value of our "Calls Heard" reports will diminish. Some operators who ordinarily send well enough have a fancy swing in their call which makes it impossible to decipher, or else it sounds exactly like something entirely

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different. We caution more care in signing off—let your signature be unmistakeable. Hang the pretty swing—get some precision. And watch how much oftener you are reported.

As to the malicious falsifiers, it is our intention to bring the full pressure of the law against the first violator we can catch, and we feel that all good amateurs will help us in this.

Stolen Autos

IN an Editorial under the above heading in our November issue we spoke of the value we could be to the community in assisting the police in the recovery of stolen automobiles, and suggested that our members see their local police and endeavor to inaugurate some such service.

We are happy to see that our requests are bearing fruit. In St. Louis, station BCO sends a broadcast at 6 o'clock every night announcing the stolen autos, escaped convicts, etc. The police are so interested that they have purchased radiophones, one of which is at headquarters and the other installed in "the wagon". At Dallas, similar arrangements have been made and 5ZC is sending out the data. In New York, where the police have their own station, the arrangement is a little different, as described in the "Affiliated Clubs" section of this issue.

Now to get to the point of this message: The information that is broadcasted must be copied and promptly delivered to the chief of police in every nearby town. It is of no avail to go to the labor of having the reports sent out if no use is made of them. There is where we come in! Let every amateur who hears these reports make it his business to report the data to his police. In that way the news will be in all the towns surrounding the city, and thru one of them the stolen auto must go. If your police pick it up thru the service you rendered, you have brought credit to yourself and Amateur Radio. The effort will be small, and the results well worth it.

QRX for Time Signals

IT does not seem to be commonly known that the radio law prohibits interference during the period time signals are being sent. Perhaps the impression is that our short waves do not interfere with the long wave signals but within short distances the QRM from forced oscillations will be very troublesome. Our attention has been called to this in a letter from Radio Inspector Kolster who advises us that the regulations are being so constantly violated that the many jewelers who depend upon the time signals from NAA are seriously inconvenienced, and the Jewelers Association has made a formal protest.

The law reads: "As a general rule, all radio stations whose transmissions might interfere with the reception of such signals and radiograms (time signals and meteorological radiograms) shall remain silent during their transmission in order that all stations desiring it may be able to receive same."

Our Operating Department requests that we keep our transmitters silent for a period of about seven minutes, commencing a minute before and ending a minute after the transmission of the time signals. The transmissions on the east coast take place during the five minutes preceding noon and 10 p.m. Eastern Time and on the west coast at the same hours, Pacific Time. Let us do this.

The Midwest Convention

IT'S gone, but not forgotten, nor will it be for many moons. There has been no more joyous affair in the history of Amateur Radio than the A.R.R.L. Convention staged at St. Louis on Dec. 28, 29 and 30. Friendships were made there that will live forever; radio acquaintances were met face to face that before had been known only over the air; for the first time in our life we saw under one roof men from every amateur district in the country; we had three glorious days crammed full of radio from early morn to as late as one could keep awake, with three big meetings where we could get up and chew the rag about every conceivable subject that enters the amateur brain. Oh but it was great!

We didn't feel that our own prosaic style was at all suited to the artistic reporting of this famous conclave, and so, our dear friend "The Old Man" actually being there, we asked him to undertake it, feeling that his gifted pen would do nearer justice to the meeting. His report will be found elsewhere in this number, and we know that all who attended are with us in a feeling of profound sympathy for the "Rotten S.O.L.'s" who were not there.

Incidentally, our A.R.R.L. Board of Direction had a meeting in St. Louis during the Convention, where for the first time our directors from the west and south actually sat in with those from the east and north, and we feel that the better understanding all of us gained by that meeting will do lots in strengthening our organization.

Calls Heard

CALLS HEARD are a peculiarly interesting part of our QST. We often wished we could have room for more of them. It has finally percolated thru to

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us that the way to achieve this is to print more of them. This we are going to do, and in this issue we encroach upon the other departments to the tune of an extra page or so, and we shall do still better—if it meets with your approval.

There are many of our readers whose lists of calls have never been published, and doubtless many of them wonder why. Men dear, if you could see our hook for Calls! It's a meat hook to start with, but it's full and dripping, and the bunch we take off each month is as a drop in the sawdust. We clean it off every month and start all over in an endeavor to publish only fresh stuff, but it quickly fills up again. Obviously there is nothing for us to do but to select the best lists, and that we are going to do. We ask you to turn to "Calls Heard" and read the introductory note this month, explaining how we are going to handle them in the future. We feel that this method is calculated to bring all of us the best possible results from this department in our magazine, and we ask your co-operation.

About Ourselves

WHAT does the A.R.R.L. do with its money? Who gets the profits of QST? Is it true that H. P. Maxim, et al., own and run that A.R.R.L. outfit to gt in a little jack on the side?

Did you ever meet up with any of these questions? Perhaps, instead, you have been solemnly assured that the A.R.R.L. was got up by a few New England men who wanted to organize all the amateurs west of the Hudson River to "use" them for handling their traffic, just to add to their fun.

So we want to say a little word about ourselves. It happens that the man who had the original idea of a relay league, our president, lived in Hartford. He had to live somewhere. But his idea was of a national and self-governing organization, and that the A.R.R.L. has always been. Our headquarters happen to be in Hartford. They have to be somewhere, and really this is a very good place for them, as we are close to the territories from which we get most of the advertising that makes our magazine possible and yet we avoid the extremely high operating costs of the larger cities. And as to the nature of our organization and how it is run, if these lines meet the eye of any reader who does not know the story, let him read:

The members of the A.R.R.L., by popular ballot, elect seventeen directors as their governing body, to serve for two years. The present board has another year to serve. These seventeen directors in turn elect our five officers from their number. Our constitution and by-laws define the duties of these officers, describe our Operating Department and tell how it shall be run, and provide that the League shall publish a monthly organ, which is our QST. No one commercially interested in radio can be a member of our Board, and except for our traffic manager and secretary, who devote their entire time to our work, no one gets a penny out of it. It belongs to the membership—which is to say that our A.R.R.L. is an organization composed of you men who read QST, that you collectively own this League and QST, and that thru the directors you elect you control its activities. That the good old A.R.R.L. stands the test of time shows that its principle is a sound one. And, men, we are growing every day.

Now about our money. The League acquired QST as its own property shortly after the Armistice at a cost of a little under five thousand dollars. It had no money, and the funds to purchase QST were raised by our A.R.R.L. bonds, with which all of us are familiar. These bonds come due in May of this year, and ever since we resumed publication in June, 1919, it has been our strong aim to save enough money in the two years to make the payment. Our source of revenue is our magazine, and, having no surplus cash, from the very start it was necessary that QST should pay its way. This it has done—it has flourished and prospered and increased in size and still made some profit, which we have put aside to apply on the bonds. (Incidentally, don't you see why we wanted you always to mention QST in writing advertisers, and urged you to buy from our advertisers? It meant results, and that meant more advertising and a bigger QST—regenerative action. It worked, too—QST right today is producing better results for the advertisers who spend their good money with us than they get from any other magazine in the country.) To get back, as we grew we had other expenses of course, and we were fortunate that we had this margin of profit to meeet our expenses. We needed extra office room, more office help and more equipment, we hired a traffic manager because the job had reached a mountainous size, and we have had legislation to fight, postage to pay, trips to Washington to make—hundreds of things to do to further the interests of the membership of the A.R.R.L., which only the fact that QST had a margin of profit made possible at all. So it has been a good thing for the League, but, fellows, QST is not owned or run individually, nor does its profit go to any individual. Our traffic manager and our secretary work for weekly wages of forty and thirty dollars, respectively, plus a commission on the results they produce. When they fail to produce results that is all they get. The rest of our

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directors get no compensation—they serve with the same spirit that actuates you men in your capacity of official relay stations, love of this fascinating game of ours!

We expect that by close shaving we will be able to pay our bonds when they come due in May, altho it is a little early to say for sure. What then—what of the future? It is up to our Board to say what changes will then be made in our policy, but probably we will go on much the same. We will not have the same incentive to save up so much money by a certain time but we will have the many other expenses of our organization to meet and the added possibility of undertaking valuable constructive work if only we can finance it. Just for one example, we would like to have money to pay the salaries and traveling expenses of two or three bang-up good men whom we could send around the country to tune stations, help fellows get going, solve the hard problems that now confront many of us, and so on. This would be splendid work for Amateur Radio, and it is just one little idea. To carry out this and other such ideas we will have to continue to make a little difference between our receipts and our expenses, but if any profit is made it will be used for such purpose as this and not for the enrichment of any individual, because our organization is so got up that is cannot be used in any other way.

The Poindexter Bill

AT this writing S-4038, the Poindexter Bill, is still in the Subcommittee on Radio of the Senate Committee on Naval Affairs and has not yet been taken up for consideration. Opinion is divided as to what action will be taken on it, rumor having it that it will come up very soon, and then again, other folks think Congress will be too busy to give it any attention during this session. One thing stands out: we amateurs have made ourselves heard in Washington and there is not a Senator but knows that S-4038 is vigorously objected to by thousands of his constituents because of its unsatisfactory provisions. Our objections are bearing fruit, and the general attitude of the Senators seems to be the realization that this bill must be amended to protect the amateur. Letters have been received by our members from several of the Senators, some taking an active interest in our behalf. Those from Senator Poindexter, however, show that that gentleman is himself not fully aware of all the provisions of the bill bearing his name, as he insists there is nothing in it unfavorable to us amateurs. This shows that we are widely apart in our views, and as the Senator intimated the possibility of further hearings, we have asked that they be held. Our Board of Direction has appointed a strong committee to go down to Washington and represent us in the event the hearings are held, and we may now expect that if the bill is ever passed it will be with amendments that properly protect the interests of Citizen Wireless.

The Pacific Convention

SPEAKING of conventions, they had one recently out in San Francisco that was a real one too. In Mr. Bessey's "land of sunshine and flowers", they have a way all their own when it comes to tackling such propositions as conventions, so we were not surprised to learn that the meeting was a wonderful success, with nearly six hundrd radio men in attendance, representing every branch of the art; that they had very complete exhibits of apparatus, commercial, navy and amateur; that clubs and communities from the whole length of the coast were represented; that in regular convention style they had a Resolutions Committee whose duty it was to frame resolutions to present to the convention in order that positive action might be secured on constructive measures; and that many such resolutions providing for increased co-operation among the amateurs in the handling of traffic, etc., were passed unanimously and no doubt have already resulted in improving west coast operating conditions.

At this convention the question arose of forming a separate relay league on the Pacific Coast, to be entirely independent of our **American** Radio Relay League. Now you know, fellows, a representative group of radio amateurs can not be got together unless the bulk of them are A.R.R.L. men—that's just what we are, the good amateurs of the country, united in a national organization. So of course the San Francisco meeting was full of loyal A.R.R.L. members. The good constructive measures, we said, were put over unanimously, but the resolution to form a separate relay league was overwhelmingly defeated.

It was splendid to see this demonstration of our strength and unity of purpose. It shows that the west coast men appreciate that our A.R R.L. truly is a national self-governing body, and that a relay organization, to be successful, must be national in scope. More important than this, it shows that they realized that there is not room for more than one relay organization, and that we must keep united the whole country over that we may present a solid front in our fights against unfair legislation. Finally, it was a concrete proof that the plan on which the A.R.R.L. is

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THE OPERATING DEPARTMENT

F. H. SCHNELL, 1MO
61 Waverly Bldg., Hartford, Conn.
TRAFFIC MANAGER



DURING the month of December the Pacific and Northwest Divisions set aside the hour between nine and ten o'clock each Monday and Wednesday night for the purpose of listening for stations east. During these periods no transmitting took place. So far we have heard from 6OH that he has recorded 9AO. Now, fellows, get out your map and look at the distance. This is something worth while and may be the means of getting over the mountains from the Mississippi Valley in one jump. Mr. Bessey advises that they are so pleased with the effort it will be continued until further notice. There is a chance for all of you now, so go to it. The time is between 9 P.M. and 10 P.M. Pacific Coast time, every Monday and Wednesday night.

Canada Comes Through

Just recently messages were received in Hartford the day following the filing date from Ontario Division Manager Russell. It has been quite impossible to trace the exact routing, and as far as we know the messages were given to 8ANJ from Russell. How did they come from 8ANJ? Further test messages are going to be run so that we may determine definitely the routing.

Northern Trunk Line

Perhaps last month's report stirred up the fellows on Trunk Line A, because the traffic has been coming and going over that route during the past month in commendable style. The only hitch at present is that some of the operators must sleep once in a while.

Southern Stations

We still need help in the southeastern part of the country if we are to move traffic consistently. Surely some of you desire to hold a place in our traffic route. Mr. Merritt, East Gulf Division Manager, has many good positions open for amateurs with good stations who seek such offices.

Total Messages

Again let me ask that every amateur in each division send in a monthly report of the total number of messages he has handled. Send this report to your Division Manager in time for him to incorporate it in his report, which must be in this office not later than the FIRST of each month.

Some of the Divisions are handling an immense amount of traffic, but no comparison can be made until every Division sends in a report. Last month the Central Division made a wonderful showing, largely because most of the fellows in that division sent their report in, while only a very few in the other divisions reported to make up the totals. Keep your Division out in front by helping your Manager, and let's see which Division really does the business. As soon as possible we will publish a monthly score, so, fellows, if your Division is to be on top you must send your reports in and on time.

The Division reports follow:

ROANOKE DIVISION
W. T. Gravely, Mgr.

All sections of the Division are progressing and with a little more high pressure, there will be efficient stations at all important points.

The University of Virginia station, 3YV, is now in the air, and Mr. Roger Wolcott of the University Radio Club advises me that permanent apparatus will be in place by January 1st, and they expect to maintain a watch up to 1 A.M. All messages for Virginia points north of Lynchburg, should be given to 3YV, except those for points near Richmond, which should go through 3ZL or 3TJ.

The Division is handling traffic, through 3EN, 3FG, 3GO, 3VV, 3AHK, 3BZ, 8SP, 8ZW and 4DM.

District Superintendent C. D. Blair, Central Virginia, has been granted a special license, with call letters 3ZL, and will use a working wave of 350-375 meters, with calling wave of 200. He will deem it a favor for anyone hearing 3ZL to write him care of P. O. Box 859, Richmond, Va.

O. M. Selph, 3TJ, Richmond, has completed a ½ K.W. set. It is particularly requested that amateurs in Petersburg write the District Supt. Those residing at points between Richmond and Washington, Richmond and Danville, and Richmond and Lynchburg, please get in touch with Mr. Blair. Mr. Blair is an enthusiastic worker and can be relied upon to link up his District with the other Districts.

Superintendent Wohlford, 3CA, Roanoke, reports he is very optimistic over the prospects, and says he is expecting good stations at the Virginia Military Institute

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(Lexington), Staunton, Wytheville and Galax. Mr. Wohlford is another hard worker. His own station, 3CA, is booming, and he is always willing to clear any traffic coming his way.

Supt. Heck, 8EF, Mannington, W. Va., reports a great deal of traffic going through 8SP of Fairmont, W. Va., and by the way, the Division Manager has found this station very effective in clearing for 3BZ at Danville, for points north and west, when it was almost an impossibility to clear through a more direct route, due to the fearful QRM and QSS. It has been found that it is very easy to clear from Fairmont to Danville, through 8SP and 3BZ. 8SP is a consistent worker.

Superintendent Bunker, 3CE, Charlotte, N. C., reports that 4CQ of Charlotte is reaching out and that tests are being made with the view of opening up the main Southern Route. Mr. Bunker will have a 1 K.W. station in operation by Jan. 1st, which will give Charlotte two reliable stations. 4CQ, Mr. Gluck, is an old commercial operator.

From the Virginia Seaboard, thru City Manager White, Norfolk, and Supt. Herndon, Portsmouth, come good reports. There gentlemen are to be congratulated on their performances under such severe handicaps. They may be heard every night, and at all hours, working faithfully to clear the traffic, which is heavy. They are assisted by 3GO, 3VV and 3AHK, also hard workers. The A.R.R.L. is indebted to these loyal fellows for their splendid co-operation and consistent effort.

The head of our Technical Committee. Mr. A. L. Groves of Brooke, Va., has had his "bumps" lately—and worst of all he has had a fine new aerial and pole blown down but—another is under way.

The Manager wishes to say that he is being ably assisted by Mr. Clark, 3AEV, of Danville. He is a willing, consistent, hard worker.

City Manager White, Norfolk District, reports there is another station in operation belonging to Mr. Gilpin, Manager of the Radio Corporation of America, here at Norfolk, call letters 3AB. Mr. Hopkins of 3GO has had considerable trouble. He has changed his antenna again; now to a 4-wire "T" type about 75 feet long. Mr. Herndon of 3FG has his Hy-rad going again and is pushing through in fine shape. Mr. Kubiac of 3VV is still going strong and has handled a good many distance relay messages from all parts of the east. Mr. Hiram Bennett of 3ACT, Norfolk, is in operation and handles a few msgs. The same is true with station 3ACE, Mr. Koon of Portsmouth, Va. There are two other stations; one in Newport News, call 3QQ and one just outside of Newport News, call 3AAG.

3EN is now in operation again and has succeeded in working with 9BW of Wichita, Kansas., a distance of 1125 miles; has also been heard in Anthony, Kans.

NEW ENGLAND DIVISION
G. R. Entwistle, Mgr.

Getting ready for those Trans-Continentals! All set in the First District. Yes, we've even got thru to Portland. The Route is—1CK (1DY), 1PAW, 1DAC, 1UQ, (1FV), and reliable. Also the northern route between Boston and Hartford—1WR, 1BT (1BAY), 1GY, 1GBC, 1JQ, 1AW, (1BBL). We all know that the southern route cannot be beaten, therefore there is no necessity of discussing the merits of—1CK, 1HAA, 1AW.

On January 8th we pulled the strings on a daylight test on the above routes from Boston to Hartford, Boston to Portland, and return. The tests started at noon from Boston.

On December 21st, a message was relayed from Governor Coolidge of Massachusetts to the Governor of California by Amateur Radio. In less than one hour from the time started the message was at 9EQ in St. Louis in spite of local QRM'ers. How's that? Thru this medium a great deal of publicity was gained by the A.R.R.L. in the Boston newspapers. The routing was 1CK, 1HAA, 2TF, 8ZH, 9EQ, as far as we know, and was handled in great style.

Mr. Furlong, (1FF) City Manager, reports traffic conditions good around Boston and 1AE, 1EP, 1ES, 1CK, 1DY clear their files quickly. Also that the time schedule suggested by the Executive Council is being supported locally and it is almost possible to do some DX work before 2 A.M. C.W. and Phone sets are numerous in and around Boston; for instance, 1AE, 1CK, 1FF, 1EP, 1JB, 1PT, 1BV, 1PL, 1BBO, 1JK, 1DR, 1YS, 1SAC, 1YC, 1XM, 1XE, etc. The arc at NAD is showing signs of QRM again on about 200 meters.

Mr. Robinson (1CK) says that 1HAA, 1DY, and 1CK are handling a bunch of traffic between them and communication is very reliable, day and night. During November 1HAA handled over 250 msgs. with a total of about 6000 words.; 1CK handled about 160 msgs. with a total of over 2000 words, and 1DY carried his share of the burden well. 1HAA has sent a service to Boston stations stating that no more msgs. for foreign countries will be accepted, therefore all traffic for Springfield, Worcester, and Portland is broadcasted ten or a dozen times and then mailed. Canadian traffic is being shoved across the border OK; 1HAA has a schedule with 2AX (Canadian) at 8:50 P.M. every night. Counterpoises are becoming popular in the

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eastern section. 1GBT, 1DY, 1EAV, 1CZ, and 1CK are among the latest converts to 1HAA's way of thinking.

Superintendent A. V. Johnson (1DY) reports things proceeding well in and about Lynn. The one exception to this is the mania of the local men to try to horn into the DX class and persist in calling anyone they hear, outside their range.

The N.E.A.W.A. opened its season with a meeting at Franklin Union, Boston. Very satisfactory meeting under the direction of Lester A. Pulley, 33 Porter St., Melrose, Mass.

A. D. M. Mix (1TS) was able to QSR a bit this month but was compelled to do all work on low power due to condenser trouble. Other stations having condenser trouble were 1AW and 1FW which put this section out of the running for a while.

D. S. Nichols (1BM) reports southern Connecticut in fine condition. 1BM has handled a total of 60 msgs. during the past month and has logged 149. He averaged 4½ hours for thirty nights on watch.

D. S. Randall (1NAQ) reports all to the berries in his district. He has handled a total of 60 msgs. in spite of transmitter trouble.

The main clearing stations for 1NAQ are 1XT and 1BBL, who is giving 1AW a lift with traffic.

D. S. McLean (1JQ) has ben unable so far to break thru to 1GY and there seems no immediate promise of a solution to the atmospheric problem. However, 1GBC at Southbridge can serve to clear traffic both ways.

A. D. M. Castner (1UQ) has divided the State of Maine into 13 districts. Castner is not superstitious. State-wide test was run successfully on Dec. 12th. We expect the University of Maine to install a good tube transmitter in the near future.

Total Messages 530.

EAST GULF DIVISION
E. H. Merritt, Mgr.

Probably the most phenomenal work being done in this division is by 4AI and 4YB on CW, fone and spark. 4AI has been reported from Buffalo, Toronto, Chicago, Philadelphia, Burlington, Iowa, etc. 4YB has been reported QSA many times in Canada, New England States, etc. 4XB and 4DM have also been heard in Canada. Will 4DM please write in and give us his name and address? 4YB has handled over 30 msgs. in the last four weeks and 4AI is also taking traffic.

4AG is still doing the same good work as usual. He reports that he has taken 25 msgs. in the last month, most of which had to be forwarded by mail.

4AO is with us again and we welcome his return to the game. This gives us an open route for traffic as far south as Jacksonville.

A few days before Xmas, 4BK made himself known by reaching out and taking several msgs. from DX stations. He is on the job nearly every night and reports that he raises a new DX station every time. He has worked 4AN, 4AG, 4YB and has been heard in Atlanta, which facts are most remarkable, as peculiar local conditions make it very hard to work these close stations. 4BK has handled 6 msgs. since opening up.

4XC has been unable to work regularly but he is ready for 'heavy duty' again.

5XA is doing good work north and south of him, but except for one or two occasions, he has been unable to work east. His sigs are often QSA in Atlanta and other Georgia cities but, seemingly, all signals from Georgia jump over 5XA to 5ZP, 5YH and others. Mr. V. C. McIlvaine of Auburn, Ala. (5XA) is District Superintendent of Alabama and would like for all men in his district to get in touch with him by mail as soon as possible.

Occasionally 4AN is heard on the air and he has worked several stations to date.

4DA has been heard "feeling around" several times while testing out. He was reported from Ohio on a daylight test with Atlanta stations.

Nothing has been heard in some time from 4AT and others in south Florida. We would all like to hear what progress is being made down there. Why not write of your difficulties at least?

Our attention has been called to stations being erected in Midville, Georgia, and Gainesville, Florida. These two stations are admirably located for relay work and we will be very glad to hear them open up soon.

Although progress is slow down here, we have a little more territory covered by radio in each report.

Total messages 61.

WEST GULF DIVISION
F. M. Corlett, Mgr.

Mr. Burle Jones, 5BR, has returned to Muskogee from Kansas City where he has been attending college, and will soon have his 1K.W. going.

A.D.S. Poor, of McAlester, reports prospects for stations at Lehigh, Farris, Shawnee, Haileyville and Krebs, Oklahoma.

Dist. Supt. Louis Falconi of the New Mexico District sends us a few little notes about the west.

Mr. Noll has resigned as Asst. Dist. Supt., in charge of the El Paso, Texas Territory.

Traffic for the west coast is being handled through stations 6IG and 6ZH with clocklike regularity.

A route to Denver and other points in

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Colorado is badly needed. 9AMB is the only station worked with us as yet, but (CWA) Colorado Wireless Association is heard in Roswell exceedingly well.

5ZJ is helping in making connection with El Paso, Texas, and State College, N. M., and 5BW at El Paso is also heard.

Traffic for Texas is easy, as stations are numerous and always on the job.

From November 15 to December 15 a total of 123 messages were handled by Mr. Falconi mostly relay business cleared through 6IG and 6ZH to the West Coast.

Harold P. Heafer, Dist. Supt., for Northern Texas, is right at his post directing League matters right and left and in a manner that is commendable.

Plans mentioned in last month's report have begun to materialize in a manner which is pleasing to us all, and a report will be forthcoming on the developments.

Clyde S. Mosteller has been relieved of his duties as Asst. Dist. Supt. of The Pilot Point Texas Territory, and has moved to Dallas. This territory has been consolidated with the new Dallas Texas Territory, which enlarges the latter with Mr. John Dorsa, Asst. Dist. Supt., in charge.

The Northern Texas District not including Amarillo and Corsicana handled 175 telegrams.

The Dallas amateurs are making plans to assist the local police in recovering stolen automobiles through efforts of local radio stations, and much publicity has been given this work by all the local newspapers, all of them praising the A.R.R.L. and its members for their splendid co-operation, etc.

Dist. Supt. Wesley Hope Tilley of the Southern Texas District, announces the appointment of Mr. F. M. Reeves, 5BO, as A.D.S. of the Austin Texas Territory.

Mr. John C. Rodriguez, 5ZR, has been appointed A.D.S. of the San Antonio Texas Territory.

San Marcos and New Braunfels are heard regularly and with San Antonio now having a dependable station, we can now establish a Dallas-San Antonio route, and keep this route working regularly the year round.

Mr. Ed. Nettleton is campaigning in his territory for new members and is doing some splendid work in his new office as Asst. Dist. Supt., of the Eagle-Pass Texas Territory.

A.D.S. Daniels of the Houston Texas Territory reports working conditions in that territory are anything but satisfactory during the past month, with QRN still on their sets.

All Austin stations are heard frequently in Houston and some messages have gone through with few repeats but best work has been done by using station 5XB for relay, as all Houston stations can work this station at any time, day or night on low power. 5ZP has been heard more often and with better strength but still "ND" for certain as yet, although two messages have gone through that route this season. 5ZA is QRK now in Houston and some satisfactory work has been done with him, also 5ZN.

Total messages 298.

NORTHWESTERN DIVISION

J. D. Hertz, Mgr.

CW! We'll say so! 7AD up in Seattle puts one over on us when he comes on the air with a CW set using just common everyday 60 cycle A.C. on the plate. There are several CW sets under construction in Portland since 7AD first blew in. Mason, in Seattle, says, "the note is nothing to brag about, but it sure roars in." In Portland we do not hear the "note", but the CW with it's 30 cycle trill is very QSA. It will do one thing 7AD's spark will not do, and that is, come in loud enough to be audible 35 feet from the fones. 7AD uses one Western Electric VT-2, with 350 volts on the plate.

The appointment of Olfan Deguire, 7CW, of Silverton, Ore., has been withdrawn. He has not the time to devote to the work. 7CW will continue active on the air when time permits.

Old Man Static has been acting up here during the past month. Ninth district stations are not heard as regularly, tho 5ZA continues to come in at times.

Great improvement is shown in the eastern part of the Division, and traffic continues to move, the only hitch at present being between 7CC and the western stations.

Traffic from this Division to the south is handled from nearly all states of the Division, and particularly from Oregon.

Astoria has experienced a dead month as far as outside work is concerned.

Mason, 7BK, of Seattle reports: The usual amount of traffic is being handled with California stations thru 7AD, 7IU, and 7IY. Portland stations are heard at times, but swing right out again, and are very difficult to work. Local interference has increased to the point where it is rarely possible to do any long distance work before 10:30 P.M. There has also been very much QRN caused by power line leakage to trees during the wet weather. 6IY is heard here good on straight CW, and the Camp Lewis and Avalon phones are QSA.

There are several stations in and around Seattle who are using power and waves in violation of the Federal laws. They should read the Editorial in January QST on obeying the law.

Miss Dow, 7CB, at Tacoma, reports:

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7CE has installed a 4 KW transformer. What's the matter with Portland? No one here has heard any Portland stations for quite a while. The "sixes" continue to roll in as loud as ever, but NIL from Portland. Is it the operators, or is it peculiar conditions? Some new Tacoma stations are opening up for DX work this winter. Among them are 7BC and 7AE. 7CB has been closed for repairs. In the future, Monday, Wednesday and Saturday nights from 8:30 P.M. on, will be regular watches for the O.W.

Friend Teed, 7FT, over in Kuna, Idaho, says that: Considerable activity is being shown by local amateurs. Three stations are reaching out, 7YA, 7GY, and the stations owned by the Martin Brothers. 7YA is not on regularly, but has been heard working UI in Moscow, Idaho, (about 300 miles) and that in broad daylight. 7GY is using three quarters KW, and works 7CC regularly, and has been heard in Los Angeles. The Martin Brothers have not been on very long but have worked stations in Salt Lake City, Sacramento, and Seattle.

Assistant D.M., H. E. Cutting, Box 517, Bozeman, Mont., reports as follows: This month finds a great improvement in the operating condition of the trunk line "A". The handling of traffic by E. L. Wharton, 7EX, Glasgow, Montana, will insure the constant working of the trunk line thru Montana.

7HM, Merwin Elton, Great Falls, has been appointed City Manager.

Radio clubs at Great Falls, Bozeman, Butte, and Glasgow, Montana have all applied for affiliation with the A.R.R.L.

F. F. Gray, 7FL, at Butte says that the radio club there has 36 members, which is 100 per cent of the radio population of the town. They all have sets of some kind or another with the exception of two. Two of these are power sets.

At Portland almost every station that operates on 60 cycle city current seems to be able to get out of Portland. Among those who have been handling traffic during the past month are 7DA, 7BR, 7BP, 7JW, 7ED, 7KB, 7DS, 7ZI, and across the Columbia in Vancouver, 7ZJ and 7ZK. 7JG has also worked out. 7ZB has been on the job with a transmitter a few nights, but has been experiencing great difficulty in maintaining an antenna in place, being located on the top of one of the highest hills within miles of Portland, and very much exposed to the wind.

Traffic goes south without much delay, but not with the ease it should. It seems to be due to the inability of the southern stations to copy the northern boys thru the "California QRM". East and west traffic with 7CC goes easily on some nights. Trouble in this case is with fading more than anything. North and south traffic with Puget Sound districts only goes periodically, 7AD, 7YS and 7CE taking the bulk of the business. Connections with Astoria have been NIL for some time. Traffic north to 7HE at Kalama, and to 7BV at Kelso goes day or night. Likewise traffic south to 7BH at Salem, and to 7IN and 7CW at Silverton can be worked day or night. 7GQ, Eugene, Oregon, about 100 miles south of Portland, is almost NIL when it is direct working. Traffic for him must go 300 to 500 miles south into the sixth district then come back direct to 7GQ. This is not a freak of a few nights, but is a freak of the Northwest.

DAKOTA DIVISION
Boyd Phelps, Mgr.

Radio Traffic thru this Division has taken a big jump during the past month and a large quantity has come from the Pacific coast over the Northern Trunk Route A. 9WU has been able to fill the shoes of 9ZX in working on the Northern Route and has taken a considerable amount of traffic from 7IM and 7CC. 7IM does not usually wish to live on about two hours of sleep per day so 9WU can not clear west every night. He works 7IM earlier when QRM is not too bad and occasionally 7CC and some in the sixth district. 9EE, also at Ellendale, North Dakota, has been doing some reaching out but neither he nor 9WU are consistently received in Minneapolis or St. Paul tho they both work well beyond. 9ZT has cleared with 9WU and 9HM with 9EE but the territory between is equal to three times the distance in other directions.

In the Northern Minnesota District, Mr. Gjelhaug, 9ZC, Superintendent, reports that he has worked 7IM, 7ZG, 9WU and 9EE to the west lately and many others to the southeast. Conditions are very irregular between him and Duluth and Superior as there are times when he knows fellows there are working but he can't hear them. He clears well with 9ZL but lately 9ZL has been coming on the job after 1 A.M. and because of pressure of business 9ZC has had to quit before midnight.

In the District of Southern Minnesota 9HM has been handling the most traffic. He is directional toward the eighth district and works that way better than anyone else in this Division. Other stations that occasionally work outside the Cities are 9XI, 9MB, 9TI and 9OI. Mr. H. R. Hall, 23 Merriam Place, St. Paul, Minn. is District Superintendent and has written many letters to stations in his district but no answers have been received to date. Fellows in this district should wake up and get into the big doings by writing to Mr. Hall.

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Mr. Merrill H. Klassy, 1970 Penn Ave. So., has been appointed Minneapolis City Manager and together with Mr. J. A. Hall, City Manager of St. Paul, should make it possible for the District Superintendent to devote most of his time to other parts of his district.

In Sioux Falls, South Dakota Mr. N. H. Jensen, Box 894 has been appointed City Manager. Being a Chief Deputy U. S. Marshal he will know how to skillfully wield the Wouff Hong.

This Division bids fair to do consistent relay work all the year around as the radio season is somewhat longer here.

MIDWEST DIVISION
L. A. Benson, Mgr.

9HT reports traffic has steadily picked up during the past month in this district. There are several new stations operating in this district that are unknown to the Superintendent. Mr. Johnson of Oakland is beginning to handle the work along Route 3. Mr. Anderson, 9EW of Omaha, has been doing noble work during the past month. The working hours of 9HT, the station of the District Superintendent, are from 11:30 P.M. to 5:30 P.M. It has been found impossible to work before 11:30 P.M. By next month a Radio phone will be in use at 9HT. 9VE, Mr. Rockwell, of Omaha, has a small set in operation and is getting very good results. During the past month fading has been entirely from stations north or south of this district.

Station are very badly needed in the northwest section of Nebraska. Mr. Stover, 9JA, reports that keen interest is being shown in his territory. 9AEQ is reaching out, and has been heard repeatedly in Massachusetts. The station at Ames, Iowa, 9YI, is going and also 9JN, the latter being heard several times on the east coast. 9ZQ at Oelwein is being read at Washington, D. C. We have 9JA going again and wish to announce that the station will be open for regular work from 6:00 P.M. to 3:00 A.M., on Saturdays and also early all Sunday evening. 9JA has no difficulty now in getting to any part of the state with ease and 9AEQ works St. Joe, and also connects with Omaha and other stations further west. 9ZQ works 9ZL regularly and many other stations to the east and north.

Mr. Stover reports that the correspondence he is receiving is taking the aspect of a big office and he has enough work for two stenographers if he had them. Mr. Turner of 9DU reports that he is writing to 9EL, 9AEG, 9BW, and 9LR, asking them to arrange a day-light test which he hopes to perfect in the near future. Mr. Turner's station is rather handicapped at present due to the fact that he is waiting for a special line transformer which will be installed in the near future.

Mr. Woods of 9LC requests that stations within approximately 300 miles listen for his radio-phone on which he transmits music every evening on 350 meters; also any traffic going through St. Louis will be handled if possible, by radio-phone or C.W.

Mr. Fritz of 9KO has perfected his route to Kansas City, Sedalia, Jefferson City, and Independence. He states that a daylight test will be run every Sunday morning at 10:30 o'clock.

9LR reports that 9LA of Wakeeney has been coming in good. 9NR of Hoisington is working on his new station. Most of the traffic work is limited to 9LR at present, as 290 msgs. were QSRed thru this station during the month of November and over 200 up to the 20th of December. Many of these were to and from the west coast routed via 6IG and 6GE at Douglas, Ariz., 6WV (ICW) at Denver or thru 5ZA. Has been able to work 6JD and 6KA in Los Angeles but with not enough success to get any traffic thru direct.

ONTARIO DIVISION
A. H. K. Russell, Mgr.

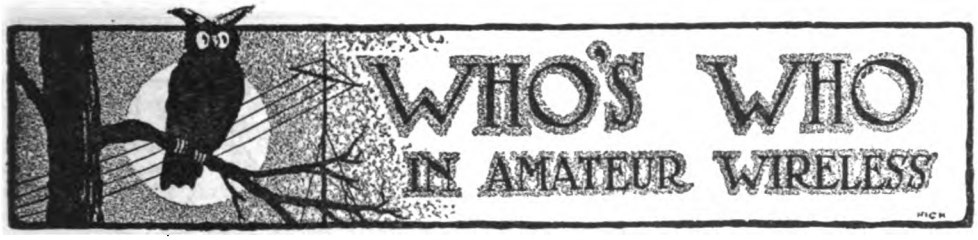
The Ontario Division has made excellent progress throughout the past month, and a great deal of active relaying has been accomplished. In fact, the month of December really inaugurated the relaying of messages in any quantity from Ontario to New York State.

The Southwestern District Manager, Mr. Carter, of Windsor, advises the main business of the DX stations in his district has been the assistance of the overloaded Detroit stations in the relaying of messages east and west from and to Ohio and Michigan. The scarcity of good inland stations is proving a great hardship in the development of a good all-Canadian chain, and this difficulty is augmented by the fact that there seems to be a zone along the north shores of Lake Erie and Lake Ontario where receiving and transmitting conditions are not nearly as favorable as when the same stations are transmitting north and south. A large Radio Club has been formed in London, and the District Manager advises that a good powered station is to be erected there immediately for DX work.

Mr. Mitchell, the Southern Ontario Manager whose headquarters are in Brantford, advises that he has no difficulty in getting into communication with stations to the south, but that considerable difficulty is had in working north or west. Mr. Mitchell reports stations heard in every U. S. district with the exception of the 6th. He also advises that the new

(Concluded on page 48)

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AS an engineer of real prominence and a member of the Advisory Technical Committee of the A R.R.L. it is fitting at this time to recount in detail some of the high spots of this man's splendid career.

When a mere boy, Frank Conrad came to the Westinghouse Company seeking a "job." At this early date, the works were located at Garrison Alley, Pittsburgh. He brought with him to compensate for the lack of the usual college training, an insatiable thirst for knowledge, a remarkable ability to grasp fundamental facts and a most retentive memory. He was a consistent reader who stored the contents of books in his fertile memory for future reference. His first work was in the shop making registering trains for the Shallenberger ampere-hour meters.

One day he evolved an idea in connection with feeding mechanisms for arc lamps and with a rough sketch, he invaded the office of the late Albert Schmidt, then in charge of the engineering work of the Company. Philip Lange was with Schmidt at the time. Mr. Conrad, in telling about this incident said, "Of course they gave me a stand off, as an idea of value would hardly be expected from a youngster in such circumstances." Although he went away disappointed, he nevertheless made a most favorable impression. It so happened that after a few days, Philip Lange, then in charge of the experimental laboratory, needed a boy to "hold voltage" and to make himself generally useful. Young Conrad was sent for and asked if he could read a voltmeter. Mr. Conrad, in a recent fanning bee on old experiences, tells us about it in his characteristic way: "Sure I could read a voltmeter, I answered, all the time wondering what a voltmeter was."

"The voltmeter was the old Cardew hot wire type which was the only alternating-current voltmeter then available. An arc lamp was being worked on and tested. I had to take voltage readings every few minutes but when we came to plot the curve there was something improbable in the results and I then realized that I had read the wrong end of the pointer. The Cardew voltmeter had a round dial with a pointer having a long tail piece. But what saved me was that I happened to find an old voltmeter under a bench and by reversing the dial I went over the readings and was able to correct the results."



MR. FRANK CONRAD, 8XK
—An Example for the Amateur—

Mr. Conrad's real opportunity came shortly after Mr. Lange left on a visit of several months to Europe. He told Mr. Conrad to "look after the place." There was not much to do in Mr. Lange's absence but Mr. Conrad had the run of the entire laboratory and he tried everything he could think of that could be done with the circuits and apparatus. During this period he augmented the foundation for his future success by developing the faculty of quickly perceiving the fundamental physical basis of any problem.

In this early laboratory, some of the basic problems of the electrical industry were being worked out. The arc lamp was

(Continued on page 45)

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The A.R.R.L. announces the completion of bonds of affiliation with the following additional amateur societies, as of December 30, 1920:

Union College Radio Club, Schenectady, N. Y.
The Butte Radio Club, Butte, Montana
Worcester North Radio Assn., Fitchburg, Mass.
Tri-State Radio Assn., Cincinnati, Ohio
Battle Creek High School Radio Club, Battle Creek, Michigan
Monongahela Valley Radio Association, Fairmont, W. Va.
Norwich Radio Club, Norwich, Conn.
Worcester Polytechnic Institute Wireless Association, Worcester, Mass.
Canton Radio Club, Canton, Ohio
St. Joseph Valley Radio Assn., South Bend, Ind.
The Galveston Radio Club, Galveston, Texas
Lane Radio Association, Chicago, Ill.
Bay Counties Radio Assn., Oakland, Calif.

Second Annual Convention of The Third Amateur Radio District

The second convention of the Third District will be held in Philadelphia, Saturday and Sunday Feb. 26 and 27, and all the necessary arrangements are being made to make this affair completely outclass the most enjoyable one held last year. These conventions are splendid things—they weld us in a way nothing else can do, and we have yet to hear of a man who was sorry he attended one. We have had several good conventions in other parts of the country, and now is the chance for the Atlantic Division fellows to get together and have **their** good time.

The meetings will be held at Turngemeinde Hall, 1705 North Broad St. There will be a technical meeting from 10 to 12 a.m., a business meeting from 3 to 5 p.m., a big banquet at 7:30 p.m., and an entertainment at 10 p.m. The following day, Sunday, visits will be made to prominent amateur and naval stations. Important and interesting matters will be before this convention—we will have legislation and improved relaying to consider, invaluable technical talks that will surely result in improving the station of every man who attends—something doing every minute.

Spread the news and get ready to attend yourself. We from Headquarters will be there if we can. Facilities for one thousand amateurs have been provided. Banquet tickets ($2.00) and reservations for board may be had by addressing either Dr. G. M. Christine, 2043 N. 12th St., or H. P. Holz, 1902 N. 11th St., Philadelphia.

Executive Radio Council of The Second District

The Second District Council announces that arrangements for co-operation with the metropolitan police in the matter of stolen automobiles have now been made, and broadcasts will be sent out daily at 7:30 and 11:30 p.m. on a wave of 400 meters by the New York Police Headquarters station, call KUVS, to be copied by amateurs in all nearby towns, who in turn are to notify their local police.

The following form of message has been decided on:

> "QST de KUVS—All amateurs copy police broadcast automobiles stolen—Overland touring dark green motor 111865 license NY 276-543—Buick 16 touring blue motor 248761 license Penn C 145—Ford 20 taxicab brown and white motor 11689" etc. Signed "New York Police".

Announcement of the inauguration of this service is being made by several prominent amateur stations in New York, and possibly arrangements will be made to have the actual broadcasts repeated by some amateur stations.

The success of the undertaking depends on the degree of co-operation we amateurs give it, and for the good of Amateur Radio all amateurs outside of Greater New York who can copy KUVS's broadcasts are requested to regularly transmit the reports to their local police and immediately report any information obtained.

Radio Research Club Merges

The Radio Research Club of New York City recently merged with the Radio Club of the Bronx in order to form one strong organization that would combine the facilities of both clubs to further Amateur Radio.

Meetings of the Radio Club of the Bronx are held every Saturday at 8 p.m. at 852 Manida St., Bronx, N. Y. All who are in-

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terested are cordially invited to attend.

Radio Traffic Assn., Brooklyn

The main point of interest at a meeting of this club on Dec. 3d was the reception of the concert given by Mme. Tettrazini. This concert, originating from her apartment at the McAlpin Hotel in New York, was sent via Bell Telephone and retransmitted from the station of the Naval Communications Service at 44 Whitehall St., N. Y. C., under the supervision of the Commanding Officer, Lt. Buckner, ably assisted by E. W. Dannals, Chief Electrician Radio, who is one of our members. At the meeting rooms of the R.T.A. reception of the concert was accomplished thru the efforts of one of the officers of the club, Dr. DeWitt L. Parker, who loaned the club his portable receiving set, which consisted of a two step amplifier and loud speaker, which in connection with the aerial of Browne's Business College gave more than satisfactory results.

One of the visitors, Mr. Henry S. Coyer, of the DeForest Company, gave a very interesting talk on the construction of vacuum tubes, both transmitting and receiving. It is needless to say in conclusion that a very interesting evening was spent by both the visitors and members.

Dallas Radio Club

The Dallas Radio Club has secured permanent headquarters and a fine club room located at San Jacinto and Masten Streets, in the building adjoining the First Baptist Church, which building belongs to the Church. Negotiations are under way for installing a radiophone set with a three hundred mile range to be used for the transmission of sermons, etc. This set will be located in the club rooms and will be operated and maintained by the club.

Essex County Radio Association.

Essex County continues to be on the map and is doing much toward the regulation of interference. 1DY, District Superintendent of the A.R.R.L., is always on the job to handle traffic and note local conditions. Essex County as a whole is much pleased with the appointment.

The Salem Section has secured a room from the school authorities and has a class two nights a week in code and theory with about forty enrolled. A County meeting was held November 26th and the whole association voted to bcome a part of the First District Executive Council.

The Beverly and Lawrence Sections are also giving instruction two nights a week with large attendance and much enthusiasm. This association has had the finest co-operation from its local newspapers and probably gains many members through consistent effort to educate the public as to the value of the amateur men.

Springfield Radio Association.

Mr. F. Clifford Estey, President of the Essex County Radio Association, was entertained recently by members of the Springfield Radio Association in an open meeting held in the club-rooms at 19 Orleans St., (Springfield, Mass.) The subject of Mr. Estey's address was "County Radio Organizations." He spoke at length on the need of getting together and combining the amateurs into one large national body to escape commercialism. In part, his talk was as follows:

"I am well known to all of you as the President of the Essex County Radio Association. Perhaps a few words as to the history of this association are not inappropriate."

The followed an interesting history of the Essex County Radio Association.

"The amateurs in America **must** get together to live, for big business is falling hard for wireless telephony, and when big business gets hold of a thing, it's hard to make it let go."

Upon request, Mr. Estey then gave a brief outline of the policy of the American Radio and Research Corporation, with which he is connected, and showed several pieces of Amrad apparatus.

Instructor Creaser of the Springfield Radio Association, and President Cushing of the visiting Connecticut Valley Radio Club, of Springfield, then gave brief talks on the advisability of combining Springfield's two radio organizations. It was decided to wait a while before doing this.

State College' (N.M.) Radio Club

The State College (New Mexico) Radio Club held its annual dance at the college gymnasium on Nov. 10th. The purpose of this was to get together funds for new equipment for the club, as well as to furnish amusement for the members and their friends. Many novelties were introduced at this event. Perhaps the most striking was the dance programs. These were made from a 5" x 7" photo creased in such a way as to make a four leaf folder with the printed side showing. The print was made from a negative taken from four photographs pasted on cardboard in the proper manner. These photos had been lettered in india ink so that all of the printing on the finished photo appeared over the pictures. The front cover showed a view of the Campus with the Engineering building and its 133 foot mast on the tower. The back cover showed a close-up of one of the club's portable sets ready for business. Inside was a picture of one of the portable sets on last year's military encampment up in the Organ Mountains, and opposite it the Radio Shack at the college.

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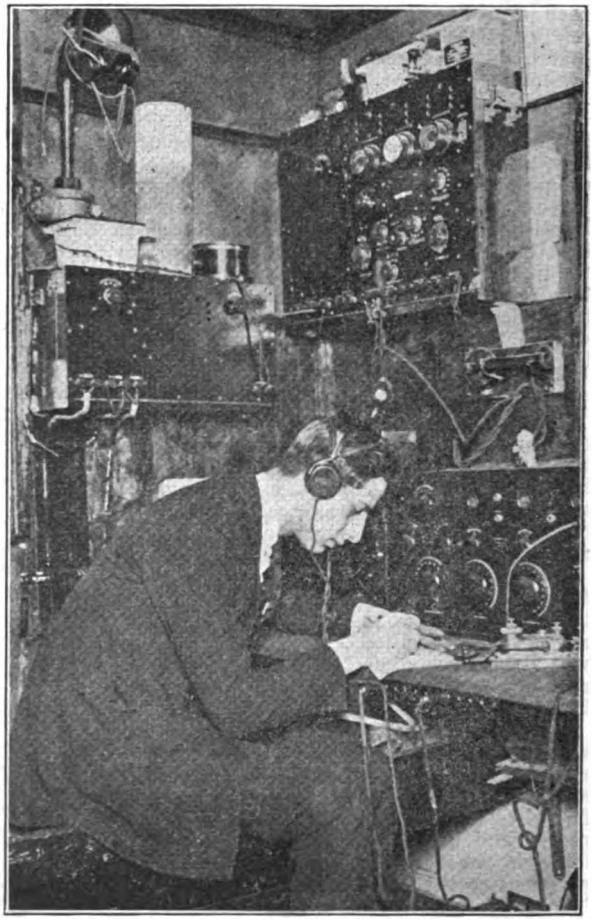
2RK, BROOKLYN

Nearly everyone east of Denver seems to be hearing 2RK, so that we are glad to have a description of it in our pages.

This station is owned and operated by J. Kenneth Hewitt, and is located at 252 Neptune Ave., Brighton Beach. The aerial, a flat-top inverted L, is suspended between two 75-foot one-piece masts, each of which is supported by two sets of five guy wires. These guys are ¼ inch stranded steel cable, broken up into 18-foot lengths by insulators. The spreaders are 18 ft. long and support the four wires of phosphor-bronze, 50 ft. long. Note the insulators which break each antenna wire at the proper length for 200 meters—a stunt which could well be adopted by others whose flat-top length is now too great. The vertical part of the aerial is in the form of a small cage, 10 inches in diameter, of four wires, running straight to the lead-in insulator on the operating room. This keeps the center of capacity high and considerably improves the radiating qualities.

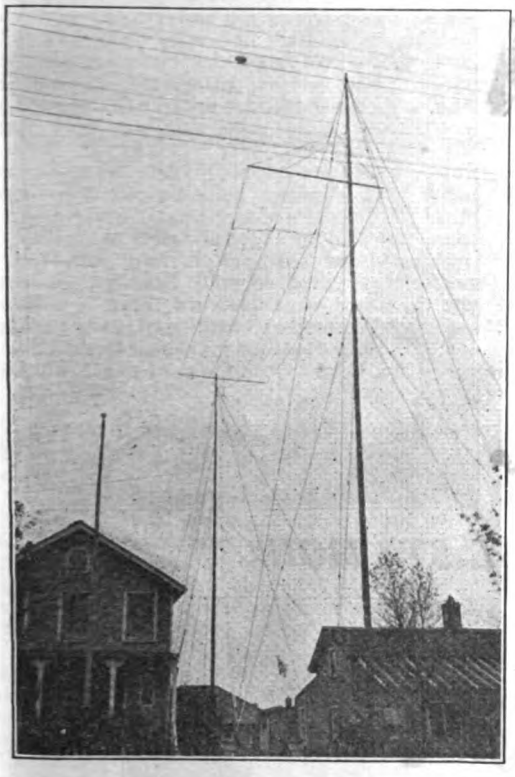
This aerial is used only for transmitting, a single 200-foot wire at right angles being used for receiving, with a break-in hookup, which adds greatly to the operating efficiency.

The station itself is a small specially-built house. The transmitting equipment is located in a pit under the floor, unfortunately making it impossible to get a photograph of it. The apparatus consists of a United Wireless 30,000-volt "coffin" transformer, a Grebe synchronous rotary gap, four Navy Leyden-jar condensers, and a pancake oscillation transformer. Four Dubilier mica condensers in series-multiple are held in readiness as an auxiliary. The O.T. has 2-inch copper ribbon for the primary, of which less than one full turn is used, and the secondary is 1½-inch ribbon of which three turns are used. A lead of copper tubing runs thru an Electrose bushing in the floor to a Marconi Type R aerial switch. Relay switches



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control the power to the transformer and the starting of the rotary gap, so that there is no A.C. wiring on the operating table. The antenna current is 3½ amperes, as indicated on a Western Electric thermo ammeter.



New Records by 2RK

As we go to press, information reaches us of the following additional achievements of 2RK: In December, copied by American ship, New York to London and back, as QSA at 3000 miles as at 250. Copied on Grebe CR-6 on English vessel at Gibraltar, 3200 miles. Reported QSA off Pernambuco, S. A., 3600 miles, on Navy SE-1420, non-regenerative. These are world's DX records for a 200 meter spark, we feel certain.

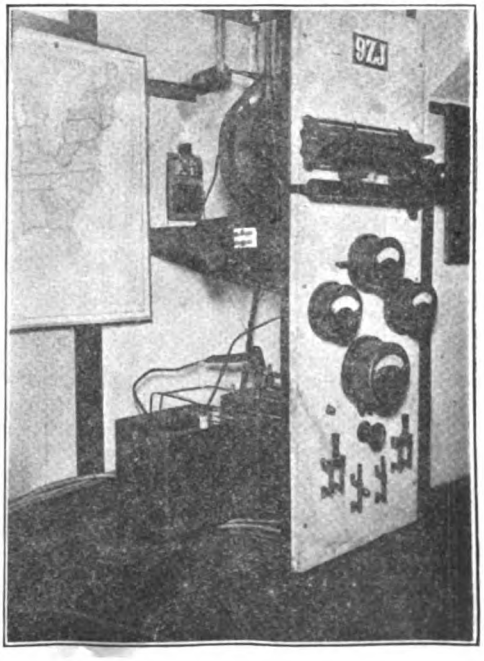
The regular receiving equipment is a Grebe CR-6, comprising a regenerative set and built-in tube equipment. A Grebe CR-3 and two-step amplifier are used as auxiliary apparatus.

2RK also has a Western Electric CW-936 radio phone. This set, on the front wall above the receiver, is a standard Navy short-wave phone set combining transmitting and receiving equipment, and is fitted with an exterior amplifier of 3 additional steps, shown on the back wall above the operator, and a loud-speaking horn. The dynamotor, operating from a 12-volt storage battery, is located under the table.

We regret we have no photo of Mr. Hewitt. The operator shown is Mr. J. V. Candido of 2RV, who formerly was one of 2RK's operators. Mr. Hewitt will be remembered as pre-war 2AGJ, with a wide reputation for making a set reach out. He tells us there is no mystery in it—that it is simply a matter of being thorough in every detail. It is this thoroughness that makes the difference between a good relay station and a poor one, and 2RK is a good one, for it has worked 5ZA, is QSA in Colorado, and has been heard night after night in Guatemala. 2RK's 3½ amperes are honest ones—they are shown on a thermo-meter—and his wave is decently sharp. The efficient design and construction of his antenna, the high-voltage transformer enabling more power to be put in a 200-meter condenser, and the use of a spark frequency low enough to insure real punch behind every train of waves—these in our opinion are the reasons why 2RK does such excellent work.

9ZJ, INDIANAPOLIS

9ZJ has been heard over two-thirds of the country, so that these photographs will be of particular interest. This station

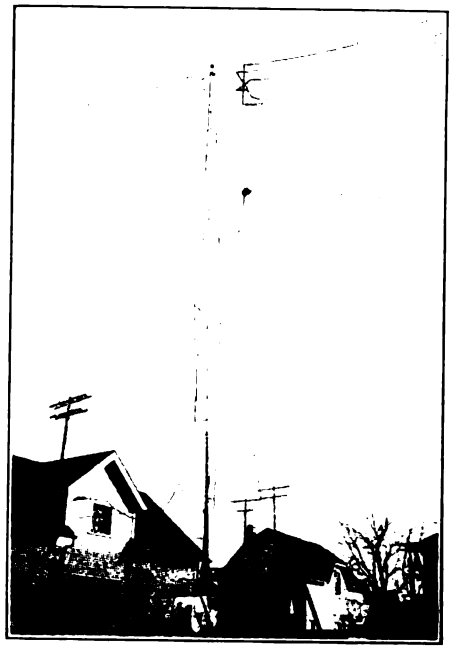


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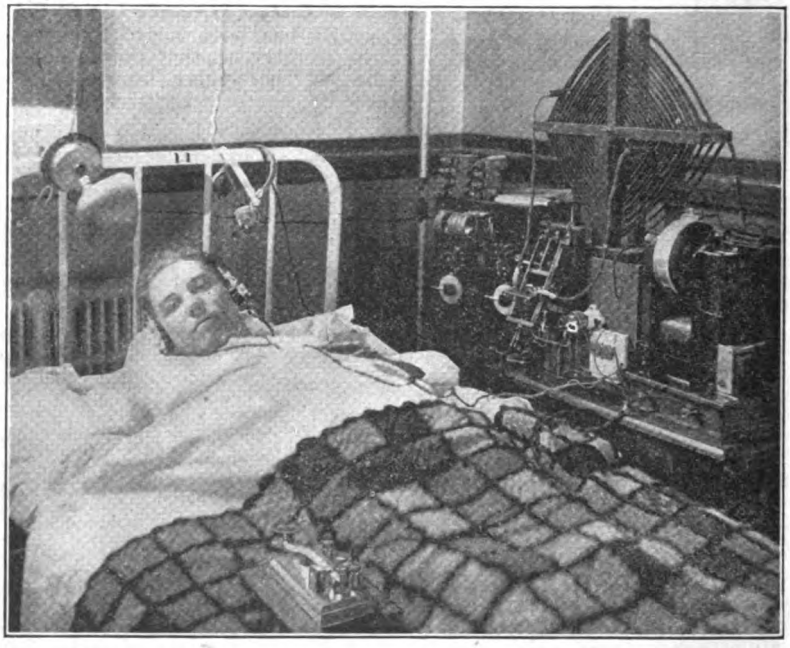
belongs to Mr. F. F. Hamilton, one of our A.R.R.L. Directors, and is devoted principally to experimental and testing work, it being Mr. Hamilton's ambition to standardize and develop transmitting apparatus especially suitable for A.R.R.L. work.

Beginning at the top and working down, the antenna system consists of a 6-wire hexagonal cage 115 ft. long, supported by two masts 88 ft. high. The masts are of black iron pipe in graduated sizes from 3 inches at the top to 7 inches at the bottom, telescoped four feet at each joint thru a reducing coupling and cross-bolted with four ⅞ in. bolts. The threads were turned out of the smaller ends of the couplings to permit the sleeving, after which the joints were wedged with small steel shims to prevent working, and the joints packed with roof cement to exclude moisture. The masts were erected by setting a 55-ft. wooden pole about 20 ft. from the base of the mast, and rigging two sets of blocks, attached to the center of gravity of the mast and to its top, both blocks being kept moving so as to prevent the masts from bending. They were rigged leaning out from each other about 5 degrees in order to oppose antenna strain.

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AN UNUSUAL STATION



This unusual photograph is of the station of Ed. V. Chapman, Toronto, Canada. Mr. Chapman, a member of our A.R.R.L., has spent nearly five years on his back, due to a spinal injury, and radio is his only hobby. Needless to say it is a great comfort to him and helps to occupy his time. His set is mounted on a table

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convenient to his bed, with everything right at hand.

The receiving apparatus uses DeForest honeycombs and DeForest variable, and contains a detector and two-step amplifier using Moorhead valves. The two headsets are of S. G. Brown make, 8000 ohms per set. NAA has been heard a distance of over 100 feet from the phones, and nearly all of the high powered stations are copied. The transmitter consists of a ½ k.w. Thordarson transformer, ½ k.w. Signal condenser, Murdock rotary, Clapp-Eastham key, and a pan-cake oscillation transformer, compactly arranged and with the change-over and other adjustments where they may be reached easily. The aerial is an inverted L of two wires, 150 ft. long.

We know what a joy and blessing amateur radio must be to this brother member. He would like to hear from other amateurs, and we feel sure some of our number can find time to drop him a line. His address is Ward A, Davisville Military Hospital, Toronto, Ont.

9ZJ, Concluded

They are not guyed, but instead are trussed on three sides and set in concrete 8 ft. deep and 3 ft. diameter. The truss bars, 3 ft. long, are held to the masts by the joint bolts, and the trussing is done with ⅜ inch messenger cable. The halliards are ¾ inch manila rope. The masts and rigging were given two coats of regular bridge paint and a single coat of black auto enamel.

The six antenna wires are paired into three conductors which drop down to about 65 ft., where they form a rat-tail which runs into the building and directly to secondary of the oscillation transformer. The two-wire aerial to the left of the mast is used for receiving.

The sending equipment is mounted on and behind the marble panel shown, and consists of an American 24,000 volt 2 k.w. transformer operated on 200 cycle current; home-made still quenched gap or Bell rotary gap; three units of Dubilier condenser totaling .012 mfd.; and an extremely heavy pancake oscillation transformer. A Western Union key on the operating table actuates an oil break on the floor behind the panel, which controls the current to the transformer and opens the antenna circuit when the key is idle. Kickback preventers are located all over the house lighting circuits and all piping is permanently grounded. The ground lead consists of a one-inch copper tube running directly from the oil break to earth, where it is buried ten feet and connected to city water mains. Additional earthing is provided by zinc plates buried under the sod below the antenna and connected to the copper tube at the ground level.

Three-phase power from city mains at 230 volts operates three motors, one belted to the 200 cycle alternator, another direct-coupled to the 100-450 volt d.c. field exciter, and the third belted to a 300-1500 volt d c. generator for experimental work. The first two are controlled by push buttons on the operating table.

It was unfortunately impossible to secure a photograph of 9ZJ's receiving equipment, which consists of a Paragon RA-6, a special two-step amplifier, and a vertical loose-coupled 600-18000 meter set equally adapted to regenerative or undamped work. A 100-mile phone set is in operation most of the time but has not yet been built into a panel.

WITH THE AFFILIATED CLUBS

(Concluded from page 41)

The decorations represented the rigging of a ship with its aerial. This was connected to one of the portable sets which, together with a loud talker, gave the crowd a chance to "listen in". All the large stations and many of the amateurs in this section of the country were picked up. The transmitter at the Radio Shack was also in operation, and the radiophone as well, which later relieved the monotony for those that did not know the code. Everybody voted it a great success and is looking forward to the time when it will be repeated.

FRANK CONRAD

(Continued from page 39)

in its earliest stages; there were no suitable instruments for conveniently measuring alternating-current quantities. Early forms of switches, lightning arresters and breakers were being worked upon.

As we look back upon it now, this period seems to have been a wonderful opportunity for the inventor and the environment which could not fail to bring out latent and natural ability. An examination of patents issued to the Westinghouse Company from that time on, shows Mr. Conrad's name so frequently that he should be given high rank among the inventors, upon whose work the business of the Westinghouse Company is based.

He was closely associated with, and later in entire charge of, the arc lamp design. This was his first real engineering work. In this connection considerable work and real advancement of the art was done by him on regulating devices and systems for arc lighting.

One of his latest activities is in connection with the company's radio enterprises when they acquired the International Radio Tel. Co.

The circumstances which led up to Mr. Conrad's becoming identified with radio are rather interesting. It so happened

(Concluded on page 48)

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Mr. Henry C. Forbes, Minneapolis, suggests the desirability of an amateur Q signal to refer to our C.W. sets. A fine idea. Let's all adopt this and make it ours like we did "QSS":

QCW? "On what wave shall I listen for your C.W.?"

QCW "Listen for my C.W. on..... meters."

Don't forget QST's Contest for articles on the best relay spark transmitter. It doesn't close until Feb. 15, so there is still time for you to write up how **you** get results.

Fourteen of us having dinner one night in the Statler dining room during the Midwest Convention were presented with a check for only $98.21. If we'd had something besides things to eat, that check might not have been so bad. Paragon Paul finally found the loose connection—somebody had one of these stuttering lead pencils which had written $77 instead of $7. Only $70 too much. Really we felt complimented that we looked like that much money.

We hate puns, but if Maxim Silencer would K. B. Warner? This awful one was actually pulled on the Orpheum stage during the St. Louis Convention.

Errata

January QST, page 16, describing Mr. Miller's wave meter coils, reads "No. 10" wire. This should read No. 18 wire.

On page 8 in the January issue an erroneous reference is made to "the instantaneous amperes shown by the antenna current meter". The antenna current meter shows R.M.S. amperes, and in the case under consideration the reading in amperes would be increased (proportional to the square root of the power increase). However, it is true in the example cited that the "instantaneous amperes" will **not** be increased.

Owens, 9EL, they tell us, has the distinction of having been asked by a small boy thirty miles away to please send time signals and a weather report each night, as 9EL is the only station he hears. Now we appreciate there are very few lulls in the din around 8ZL, for instance, but we didn't know it was that bad in Kansas.

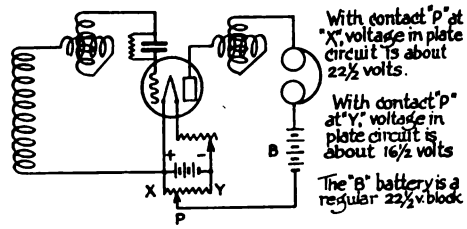
Mr. A. E. Bessey requests that we correct a rumor that he has a connection with The Radio Shop, San Jose, Cal. Mr. Bessey has a large and growing business of his own which takes up all the time he can spare from A.R.R.L. work. Division Manager Bessey's son, Mr. E. H. Bessey, is a member of the firm of The Radio Shop, which probably caused the confusion.

Zeller's (9AU's) modulation is getting pretty good on the dictaphone lately. What kind of bulb does he use?

The Deseret News, Salt Lake City, Utah, have installed a 1 K.W. station with call letters 6ZM, for the purpose of sending a press schedule each night to the amateurs in that section of the country. The transmission starts at 9 o'clock Mountain Time, on 375 meters. 6ZM has an Acme transformer, an oil condenser especially built for the set, Benwood rotary, Western Radio oscillation transformer, and a receiver using honeycombs and a two-step. They are ready and willing to handle A.R.R.L. traffic at any time.

Zee: "Does your grid leak?"
Nith: "No, I've got Neverleak in mine."

2UD sends us this handy kink for getting the correct voltage on the new Radiotrons. With the potentiometer located as shown, the plate voltage may be varied



from about 16½ to 22½ volts without the usual troubles attending the use of a potentiometer. Be sure about the polarities.

A Toronto newspaper displays a cut of the Nauen station building over the title "The most powerful radial station in the world." We can't see where the street cars run in to it, but it may be a good

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radial station altho not the world's largest radio station—not since LY and 9ZN started their schedule.

According to a newspaper item, 9BY has a rooster who crowed so loudly over 9BY's radiophone that it awoke the wife of a radio man in Dallas, who got up and started to prepare breakfast. No comment.

8IK, Ashland, Ohio, proudly reports the reception of signals from 6ER, Los Angeles, at 6 a.m. E. S. T., November 28th. We understood 9XM heard 6ER at the same time.

Wondering who KDKA is? Westinghouse Elec. & Mfg. Co., East Pittsburgh, 375 meters.

Has anybody used the G. E. dynatron circuit for C.W. transmission?

New York "World" recently had a very interesting full page of amateur station photographs. But how they get twisted on the radio language. They show one phone station whose call letters they give as "U-R-X-O-M". The reporter probably heard the operator tell somebody "QRX, OM". Oh, well, if he hadn't we'd have been shy a smile this month.

Our Traffic Manager, Geschnell, got busy on his own hook and wrote letters to all the Senators comprising the Committee on Naval Affairs. Among the acknowledgements received was one from Senator Walsh, of Montana, who replied on his letterhead as Chairman of the Senate Committee on Disposition of Useless Papers in the Executive Departments. Hi about that! We can state that in the opinion of about a quarter million amateurs it is altogether fitting and proper that the Poindexter Bill, S-4038, should be referred to Senator Walsh's committee for appropriate disposition. It surely should come under his jurisdiction!

The abbreviation "QSS" is frequently heard now in the commercial game, and the fellow at the other end usually knows what is meant.

Re log systems: most of the commercial companies use a form having three narrow and one wide columns, headed, respectively, "Time", "Station Called", "Called By", and "Remarks". This seems to us a good form for amateurs to follow.

WOULDN'T IT BE WONDERFUL—

If 3GO didn't put a different antenna every Sunday and holiday?

If honeycombs would give tight coupling with exactly even centers?

If some of these fellows with big antenna currents would measure 'em on a thermo-couple ammeter?

If 3VV would try both feet sometime so DX men could get his call before the 99th time.

If 8XK's buzzer was as loud as his generator hum?

If some of these amateurs, and amateurs-to-be could write so that a printer could read it?—Linotype Dick.

Need a few more "Wonderfuls", fellows.

On Nov. 28th the U. S. Mine Sweeper "Swan" went ashort near Duxbury, Mass., in a terrific northeast gale, and her crew were saved in as sensational a rescue as was ever witnessed on the New England coast. During the trouble and the events which led up to it, the "Swan" was in touch with the Charlstown navy yard, with nearby amateurs as interested listeners. After the "Swan" was aground, she found it impossible to get thru direct with her radio, when 1FBF, Cushing, of Duxbury, jumped into the breach and relayed her message to KQZ, "City of Rome", who in turn forwarded it to the navy yard.

The Somerville Radio Laboratory have an interesting line of apparatus and parts for the C.W. experimenter. One of their specialties is a split-secondary modulation transformer, with half the secondary in the grid circuit and the other half in the plate circuit. They also have an extremely nifty dial and knob combination, suitable for condensers, variometers, etc. The heavy metal dial is 4½" diameter, satin nickeled, with a counter-clockwise scale for clockwise reading in black enamel, with a 2 inch Navy knob. This is a high grade accessory that will add to the appearance of any set. If the dials be grounded they should act as considerable of a shield from capacity effects, and their satin finish takes pencil calibration by call letters OK.

New Books Received: "The Thermionic Vacuum Tube and Its Applications," by H. J. van der Bijl, M. A., Ph. D.; Research Physicist, A. T. & T. Co. and Western Electric Co. Published November, 1920; 391 p.p., 6x9, 232 illustrations.

Despite the importance of vacuum tube development and the extensive literature that has grown up, there has been no authoritative, single textbook dealing comprehensively with the subject.

Dr. van der Bijl has had an exceptional opportunity as research investigator of the Western Electric Co. and the the American Telephone and Telegraph Co. to collect data on thermionic vacuum tubes.

His book supplies the first comprehensive and reasonably concise treatment of principles of operation and the more im-

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portant phenomena exhibited by the passage of electrons through high vacua.

The first chapters are purposely elementary. Chapter IV discusses the characteristics of the thermionic valve, while the influence of gases in the bulb on the characteristics of the valve is dealt with in Chapter V. The operation and some of the uses of the valve are described in Chapter VI. Chapter VII describes the amplifier, the manner in which it operates and the circuits that can be used. It includes also a treatment of the characteristics of the three-electrode tube. Chapter VIII deals with the efficient operation of a three-electrode tube as an oscillation generator. The processes involved in the detection of electromagnetic waves and in the modulation of high frequency waves are treated together in Chapter IX. In Chapter X a few miscellaneous applications of the thermionic tube are illustrated.

The remarkable ability of thermionic vacuum tubes to perform a great variety of functions has gained for them a wide interest, and consequently this new book will, we believe, find a ready welcome. It is elementary enough to meet the demands of those who are interested in delving into the why and wherefore of tube operation but who are not sufficiently acquainted with electron theory to understand the briefer explanations heretofore published. And from there it covers every phase of tube work in an authoritative manner. We consider it splendid, and can recommend it to anyone desiring a comprehensive text on this subject.

The net postpaid price is $5.00, available promptly from QST Book department.

FRANK CONRAD

(Concluded from page 45)

that during the course of a discussion, such as often takes place across the lunch table, one of the engineers displayed a watch he had just bought. This brought on the usual argument which often takes place between friends in such cases, regarding the relative merits of watches. The principals of the argument decided to compare their watches daily with the company's master clock, which is controlled by Western Union Time Service. Mr. Conrad, who by the way, is also an expert in the theory and construction of time pieces, discovered variations which he could only account for on the assumption that there were errors in the Western Union Time Service. This was during the early days of radio when operation by amateurs had not been generally attempted. Mr. Conrad made a rough coil or two, and a condenser, set up a small antenna, and soon he was able to receive the Arlington time service. He still has his watch but his opponent in the argument traded his for a better one.

To Mr. Conrad, a "hobby" is a study which he makes in an exhaustive manner—whether it be raising gold fish, or studying lower forms of animal life. The accumulated result of all these hobbies is a versatility of experience that is remarkable and unusual.

Thus, radio became his latest hobby and it was not long before he had a radio station, the equal of any in Pittsburgh, on the upper floor of his garage, where he tried new ideas, on many of which he has entered important patent applications.

The came the War and with it the company's activities in connection with the Navy and War Departments. Mr. Conrad's radio knowledge was a contribution to the winning of the War. His assistance was very highly appreciated by both the Signal Corps, Radio, and the Navy Radio Departments at Washington.

Mr. Conrad has no established specialty, and is not tied to any specific department. He is free to devote his talents where most required. Any technical problem of especial concern is most likely to be referred to him for his opinion and it is an interesting fact that as the various engineers progress in experience and responsibility they show a growing recognition of the value of his advice, by their increasing desire to consult him on important matters and thus take advantage of his broad experience and judgment.

A description of Mr. Conrad's station, 8XK, was published in QST for September, 1920.

THE OPERATING DEPARTMENT

(Concluded from page 38)

station at Chatham, Ontario, is nearing completion.

Toronto has come along well in relaying. The Manager's station 3AB worked steady CW transmission to 8ANJ all through the past month tho only using a few watts, and worked day or night, relaying many messages to and from the United States. The higher powered CW stations at 3AB and 3AC will be in operation, shortly.

THE PACIFIC CONVENTION—Editorial

(Concluded from page 32)

founded—of a non-commercial organization of, by and for the amateurs who compose it—is a really good one, a foundation on the rock!

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Library

QST'S DIRECTORY OF CALLS

ADOPTING the Department of Commerce's list of amateur stations as it standard, QST will publish each month the calls of new stations in each district commencing where the government book stops. To make this possible, amateurs are requested to report new or changed call letters to this office.

FIRST DISTRICT

James C. Ramsey, Jr.,	36 Kilsyth Rd., Brookline, Mass. (Correction)	1QR
Samuel A. Waite,	49 Benefit St., Worcester, Mass.	1GBA
Frederick Grindle,	9 Second South St., Bar Harbor, Me.	1GBB
William E. Arnold,	183 Oliver St., Southbridge, Mass.	1GBC
George W. Long,	13 Windsor Rd., Somerville, Mass.	1GBD
Anthony O. Leske,	456 Grafton St., Worcester, Mass.	1GBE
Allyn R. Beatty,	57 High St., Saco, Me.	1GBF
Waitt & Sackett,	191 Oxford St., Lynn, Mass.	1GBG
W. O. Benson,	16 Fern St., Worcester, Mass.	1GBH
F. Edw. Handy,	Riverside Drive, Augusta, Me.	1GBI
Alex. J. Koziell,	15 Elm St., Bristol, Conn.	1GBJ
M. R. Young,	82 Willow St., Augusta, Me.	1GBK
John E. Norman,	17 Turket Shore Rd., Ipswich, Mass.	1GBL
Alfred Korb,	82 Milton Ave., Dorchester, Mass.	1GBM
Murray Stearns,	20 Center St., Watertown, Mass.	1GBN
H. I. Isaacson,	155 Retreat Ave., Hartford, Conn.	1GBO

SECOND DISTRICT

Sidney Kasendorf,	910 Home St., Bronx, N. Y.	2ATV
I. S. Hirsch,	2981 Briggs Ave., Bronx, N. Y.	2AUE
I. S. Simpson,	207 Sixth Ave., Brooklyn, N. Y.	2AZJ
Albert Wilson,	49 Lawrence Ave., Brooklyn, N. Y.	2AZM
Wm. Cunningham,	266 Pacific St., Jamaica, L. I.	2BAD
Richard Leitner,	1113 Forest Ave., New York	2BAH
Sigurd Knudsen,	138 Senator St., Brooklyn, N. Y.	2BAP
Henry Roth,	53 Lawrence Ave., Brooklyn	2BCD
Saml. Kopelson,	251 East 4th St., Brooklyn	2BCF
Donald Phelps,	716 Ocean Ave., Brooklyn	2BEH
Hyman Heller,	134 Amboy St., Brooklyn	2BFG
P. J. Faulkner,	Paterson, N. J.	2BFH
A. J. Brozzollari,	661 61st St., Brooklyn	2BFP
A. B. Fisher,	96 Edgewood Ave., Yonkers, N. Y.	2BGD
Wm. G. Moore,	68 Maolis Ave., Bloomfield, N. J.	2BHT

THIRD DISTRICT

Wm. S. Creighton,	434 Wash'n Ave., S. W., Roanoke, Va. (Correction)	3RF
H. A. Snow,	1656 Newton St., N. W., Washington, D. C.	3ZE
G. P. Hamilton,	108 Pine St., Millville, N. J.	3AAN
L. H. Dunnam,	2375 Champlain St., N. W., Washington, D. C.	3AAO
R. B. Green,	1004 Hamilton Blvd., Hagerstown, Md.	3AAS
W. B. Flaherty,	2377 Champlain St., N. W., Washington, D. C.	3ACF
Kelsey Calkins,	South 4th St., Millville, N. J.	3ADG
F. W. Mergenthaler,	Collegeville, Pa.	3ADO
Gulliam G. Ciamer,	Collegeville, Pa.	3AIA
F. A. McGarry,	6080 Christian St., West Philadelphia, Pa.	3AKO
G. P. Weaver,	Camp Hill, Pa.	3AKZ
J. E. Williams,	Bonsall Ave., Fernwood, Pa.	3ALD
E. B. Montague,	821 Third St., N. E., Washington, D. C.	3ALR

FOURTH DISTRICT

Albert W. Parker,	15 Change St., New Bern, N. C.	4EA
E. H. Brack,	Midville, Ga.	4FD

FIFTH DISTRICT

John Dorsa,	117 W. 12th St., Dallas, Tex.	5JG
F. H. Rowland,	P. O. Box 14, Comanche, Tex.	5JX
Jack Moore,	5015 Ross Ave., Dallas, Tex.	5JY
G. T. Conner,	508 E. Jefferson Ave., Dallas, Tex.	5KF
Floyd Williams,	619 E. Hurd St., Edmond, Okla.	5LB
A. P. Daniel,	2504 Bagby St., Houston, Tex. (Corrrection—ex 5AO)	5ZX

SIXTH DISTRICT

Following reassignments; cancel assignments in Call Book:

N. A. Morgan,	866 32d St., Oakland, Cal.	6FV
C. A. Peregrine,	1039 Merced Ave., Berkeley, Cal.	6IK
F. A. Brandis,	116 Polk St., Napa, Cal.	6IY
J. J. Mahler, Jr.,	Los Altos, Cal.	6UB
E. A. Portal,	223 Cowper St., Palo Alto, Calif.	6BM

SEVENTH DISTRICT

E. Sheets & John Julian,	Oak Grove Ore.	7KB
Billings Polytechnic Inst.,	Billings, Mont.	7XD

EIGHTH DISTRICT

Following reissued calls; cancel assignments in Call Book:

Jas. E. Penberthy,	486 W. Phila. Ave., Detroit	8DW
A. H. Benzee, Jr.,	196 Keystone St., Buffalo	8FE
Detroit Radio Labs.,	3661 Gratiot Ave., Detroit	8GZ
W. T. Pasanen,	21 Lamson Pl., Detroit	8HQ

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W. Weaver, Jr.,	610 Church St., Ann Arbor, Mich.	8HO
Robt. Palmer,	6050 Northfield Ave., Detroit	8PY
D. A. Hoffman,	50 S. Balch St., Akron, Ohio	8UX

Following are new calls:

Paul N. Elving,	1238 Sunday St., N. S., Pittsburgh, Pa.	8AJM
Samuel F. Kruper,	Amyville P. O., Gratztown, Pa.	8AJN
Jack McKinley,	Box 1044, Uniontown, Pa.	8AJP
Dale K. Auck,	141 W. 11th Ave., Columbus, O.	8AJQ
Paul Woodward,	237 E. Main St., Kent, Ohio	8AJR
Glenn A. Walde,	223 S. Union St., Salem, Ohio	8AJS
Phillip Schwartz,	218 Grant St., Washington, Pa.	8AJT
Wm. B. Wines,	1208 Hill St., Ann Arbor, Mich.	8AJU
Fred Kucklick,	622 Vine St., Coshocton, Ohio	8AJV
Charles F. Sarver, Jr.,	3280 Orleans St., Pittsburgh, Pa.	8AJW
Irl M. Chambers,	37 Montrose Ave., Delaware, Ohio	8AJX
Edw. A. Musser,	711 Pearl St., Wapakoneta, Ohio	8AJY
Louis Karnok,	2759 McCurdy Ave., Cleveland, Ohio	8AJZ
Carl F. Woese,	802 McBride St., Syracuse, N. Y.	8AKA
Gustaf W. Norling,	Buffalo St., Freeport, Pa.	8AKB
Robert C. Bohannan,	173 E. Hudson St., Columbus, Ohio	8AKC
Albro Harper,	R. D. No. 1, Niles, Ohio	8AKD
Thomas Sage,	2001 E. Jefferson, Detroit, Mich.	8AKE
Harry E. Fitch,	219 W. Church St., Elmira, N. Y.	8AKF
Harry W. Lewton,	3227 West 56th St., Clevelnd, Ohio	8AKG
Paul T. Criswell,	107 Farragut St., Vandergrift, Pa.	8AKH
Wm. G. McKenzie,	3712 Mifflin St., Pittsburgh, Pa.	8AKI
C. G. Chapel,	430 Almyra Ave., Youngstown, Ohio	8AKJ
Francis N. Kryszewski,	1319 North St., Rochester, N. Y.	8AKK
Moncreif A. Spear,	539 Wheeler Ave., Scranton, Pa.	8AKL
Karl A. Helman,	2437 East 82nd St., Cleveland, Ohio	8AKN
M. Crosby Bartlett,	236 Burns St., Detroit, Mich.	8AKO
John D. Bohannan,	226 16th Ave. Columbus, Ohio	8AKP
John McFarren,	1215 Chislet St., Pittsburgh, Pa.	8AKQ
Robert Steiner,	1050 Trumbull Ave., Detroit, Mich.	8AKR
Henry J. Partridge,	135 Broadway, Dover, Ohio	8AKS
Howard Mattes,	189 Avenue B, Rochester, N. Y.	8AKT
F. Ray Spindler,	1762 St. Paul St., Rochester, N. Y.	8AKU
R. Milton Turrell,	506 Broadway, Harrison, Ohio	8AKV
Wm. D. Myers,	190 Franklin Ave., Vandergrift, Pa.	8AKW
Edw. H. Cox,	9 Pierce Ave., Hamburg, N. Y.	8AKX
Luther J. Kovalik,	322 Hunter St., Niles, Ohio	8AKY
Fred M. Wargowsky,	1021 9th St., Port Huron, Ohio	8AKZ
John H. Dande,	462 Carey Ave., Wilkes Barre, Pa.	8ALA
John Aitkenhead,	162 N. Portage Path, Akron, Ohio	8ALB
Annunciation High School,	Parkview & Jefferson, Detroit, Mich	8ALC
James M. Boyer,	6116 Howe St., Pittsburgh, Pa.	8ALD
Frank W. Day,	111 E. Sandusky St., Findlay, Ohio	8ALE
Olin McPherson,	2510 Grand Ave., Parkersburg, W. V.	8ALF
Guy C. Sudborough,	White Pigeon, Mich.	8ALG
Glen M. Cornell,	16 Elizabeth St., Hudson Falls, N. Y.	8ALH
Robert J. Beatty,	86 N. Monroe Ave., Columbus, Ohio	8ALI
Willis H. Farnum,	17 Atkinson St., Rochester, N. Y.	8ALJ
Raymond E. Corts,	243 May St., Buffalo, N. Y.	8ALK
Daniel L. O'Hair,	93 East 7th St., Oswego, N. Y.	8ALL
Carlos E. Brewer,	185 Harker St., Mansfield, Ohio	8ALM
Geo. S. Hussey,	127 East 3rd St., Cincinnati, Ohio	8ALN
Kenneth Steward,	314 S. Vine St., Van Wert, Ohio	8ALO
Arthur C. Wrigley,	R. D. No. 1, Venetia, Pa.	8ALP
John W. Bankhurst,	Damascus Road, Salem, Ohio	8ALQ
Roy E. Sloyer,	308 Monroe St., Kalamazoo, Mich.	8ALR
Herman H. Lipman,	753 Allegheny Ave., Oakmont, Pa.	8ALS
Clyde Hillman,	2800 Veteran St., Pittsburgh, Pa.	8ALT
John Lukasko,	1318½ Halsey Pl., Pittsburgh, Pa.	8ALU
W. B. McQuiston,	6315 Bartlett St., Pittsburgh, Pa.	8ALV
Sam Workman,	731 E. Maiden St., Washington, Pa.	8ALW
Marion A. Mead,	High St., Savannah, N. Y.	8ALX
H. Hartwell Hurd,	914 Greyton Road, Cleveland Heights, Ohio	8ALY
Michigan Agricultural College,	East Lansing, Mich.	8YG
C. W. Waggoner, West Va. Univ.,	Morgantown, W. Va.	8YH
Geo. Carter, Junior College,	Detroit, Mich.	8YJ
Ohio Wesleyan Univ.,	Delaware, Ohio	8YK

NINTH DISTRICT

Broadview Seminary (F. Johnson),	La Grange, Ill. (Re-issued)	9DT
Theo. C. Combs,	1540 S. Lawrence Ave., Wichita, Kan.	9KA
E. W. Kimbark,	926 Michigan Ave., Evanston, Ill.	9AMZ
H. C. Harvey & "YM" Haynes,	David City, Nebr.	9ANF
C. F. Kramer,	414 E. Pearl St., Lebanon, Ind.	9AOB
R. L. Coe,	607 Linden Ave., Clayton, Mo.	9AON
J. A. Callanan,	819 Lawrence Ave., Chicago	9AOY
M. G. Goldberg,	711 Dayton Ave., St. Paul, Minn.	9APW
Robt. Tucker,	1516 S. Lawrence Ave., Wichita, Kan.	9APY
D. A. Downard,	532 No. 26th St., Louisville, Ky.	9ARU
Chas. Lampel,	135 W. Ray St., Indianapolis	9AUB
Allan Mallorry,	1144 University Ave., Wichita, Kan.	9AUO
Willard McCulla,	481 No. Sheridan Rd., Waukegan, Ill.	9AVP
A. S. Grossman,	3968 Wolff St., Denver, Colo.	9AVS
Harold Palin,	146 W. 38th St., Indianapolis	9AWO
Erwin Ahrens,	1509 Crawford St., Boone, Iowa	9AXU

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Radio Communications by the Amateurs



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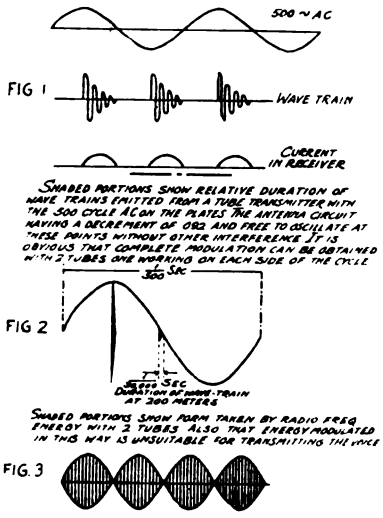
RE A.C. PLATE C.W. SETS

1322 Kearney St. N. E.,
Washington, D. C.

Editor, QST:—

1. My interest in experimental radio prompts me to produce some interesting facts in contradiction to some parts of your article on A.C. plate, C.W. sets, in the December QST.

2. My first point of attack is to call your attention to the misconception among radio men of the frequency of the note received from radio sets. It seems to be common practice to speak of the received note from a 500 cycle spark set as 500 cycle pitch while in reality it is a 1000 cycle note. The explanation is easy. For each alternation of current from a 500 cycle alternator (if the set is properly adjusted) a wave train is launched, Fig. 1, and for each wavetrain the receiver diaphrams receive one impulse causing them to pass thru a cycle of mechanical



motion. The frequency of the received impulses, therefore, is one cycle per alternation or 1000 cycles per second. With the A.C. plate tube transmitter using one tube and one half of the cycle, one spurt of energy will be sent forth for each cycle; therefore, 60 cycle supply will give a 60 cycle note at a receiving station. Two tubes, one working on each side of the cycle will give a 120 cycle note.

3. What about this poor modulation with two tubes? If the grids are conductively connected to their filaments by proper leaks as per the diagrams, and in a similar manner to that of a regular C.W. set, why the accumulation of a high negative charge, taking a relatively long time interval to leak off? If such were the case, the sets would not oscillate during the time that the high charge is present and this very principle is taken advantage of in grid modulation and straight C.W. sets by placing the key or the secondary of the microphone transformer in the grid lead. In a straight C.W. set the charge leaks off at a frequency equivalent to 200 meters or less. Why not at the rate of 60 cycles? The charge on the grid in such a set is not a value due to accumulation but is a series of values, first plus and then minus, impressed upon it from the plate circuit via the grid coupling.

4. Now for the wave trains that persist with the damping of the antenna. Suppose, suddenly, the source of energy was removed leaving the antenna circuit free to oscillate at 200 meters and at a decrement of .092. How long would the resultant wave train exist relative to 500 cycle supply? Take a look at Fig. 2. The shaded portions show the relative duration and amplitudes of two wave trains launched at different points. It is obvious that no wave trains with any considerable amplitude would carry past the zero points between alternations. In actual operation, however, the action is still better for the energy is not radiated as a series of overlapping wave trains. It is actual spurts of sinusoidal C.W. energy of varying amplitude and the decrement is practically zero, so that complete modulation is obtained with two tubes, one working on each side of the cycle.

5. For the last point of attack. Is energy radiated in 60 or 500 cycle spurts suitable for transmission of the voice, when the voice modulates its carrier energy at an average frequency of 1000 cycles? Take a look at the form taken by energy from a set with A.C. on the plate, Fig. 3, and tell me what becomes of the voice at the points of zero energy. Alas! It is lost.

6. Why give the radio enthusiast a

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wrong steer at the beginning of a new and promising field?

Sincerely your subscriber,
W. Hollis Hoffman.

Editor's Comment—Our correspondent's interesting letter gives us a welcome opportunity to unburden ourselves on several phases of this subject.

Strictly speaking, we were in error in mentioning the tone received from one-half of a 60 cycle wave as a "30 cycle note". It was done intentionally, however, our desire being to convey the idea that the tone resulting from such a set would be similar to that obtained from a fixed gap spark set operating on 30 cycle current instead of 60 cycle.

In his third paragraph Mr. Hoffman has misinterpreted our article. Our reference to the time interval between trains during which the charge leaked off the grid had reference to the detector tube, not the transmitting bulbs. Perhaps we can make ourselves clearer. Referring to Fig. 4, A represents a 500-cycle sine-wave voltage which will here be used with reference to both spark and C.W. B represents the envelope forms of a synchronous spark set operating on the voltage A. If the wave length is 200 meters and the decrement so low that there are 50 oscillations in the train, the entire train will have consumed 1/30,000 of a second, while the trains are 1/1,000 of a second apart, giving an interval between trains 29 times the length of the train itself. During this time the accumulated charge on a detector grid leaks off. It is true that if the transmitting antenna were suddenly charged and permitted to oscillate at its own damping, the wave form would be as Mr. Hoffman shows in Fig 2, but in the case of C.W. sets using A.C. on the plate we will have an impressed positive potential during an entire half cycle and can expect the envelope to be somewhat after the fashion of C in Fig 4—existing for the entire half cycle. Now note that the time interval between trains is not longer than the actual duration of the train. Using two tubes and employing both halves of the cycle we might expect an output envelope similar to D, in which case the time interval between trains is zero. Our point was that ordinary detector tubes with leaky condensers are not designed to work under such conditions, and that better non-oscillating reception would be obtained from C than from D

The above presumes that the tubes will oscillate over the entire range of instantaneous voltages, which is questionable. If they will not, there will actually be an interval between trains, but we still point out that the output is better suited for heterodyne reception than non-oscillating.

However, Mr. Hull's paper, No. 381 of the Bureau of Standards, cites that in the case of a sinusoidal voltage as at A, the output envelope is not of the form shown at C, but rather of the peculiar characteristic shown at E, the exact reasons for which are not known. It will be noted that even after the zero point is reached in the exciting potential, radiation continues, "the wave train persisting with the damping of the antenna after the tube has ceased to supply power to the antenna." This is logical—the antenna is charged.

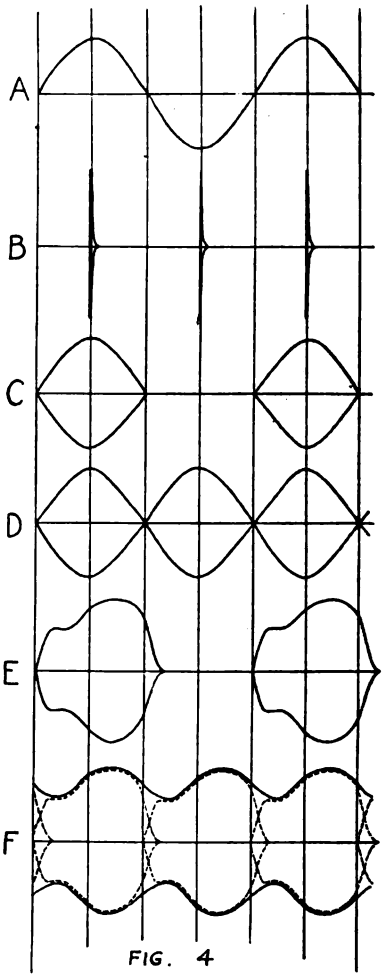


FIG. 4

Going a step further we may presume with some plausibility that the use of both halves of a sine voltage on two tubes working on either side of the cycle will give us an output envelope shown by the dotted curves of F, which, added graphically, will give a resultant somewhat similar to the full curve of F. This, it will be apparent, is a far cry from the completely modulated

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output of Mr. Hoffman's Fig. 3, and obviously better suited for heterodyne reception than non-oscillating. So much for his fourth paragraph.

The Editor has never seen a radiophone operating with A.C. on the plates, but that is no sign that it can't be done. We believe it can. The modulation in F of Fig. 4 is far from 100%. In a set of this kind at the Radio Corporation of America at Aldene, N. J., we understand the "supply modulation" has been reduced to about 30% simply by utilizing the reactive properties of large chokes. Speech of some fashion can be transmitted even under such circumstance as that, and with improvement in the ironing-out process it can be made wholly practicable.

We reiterate our belief that the D.C. generator will be outgrown in Amateur C.W.—K.B.W.

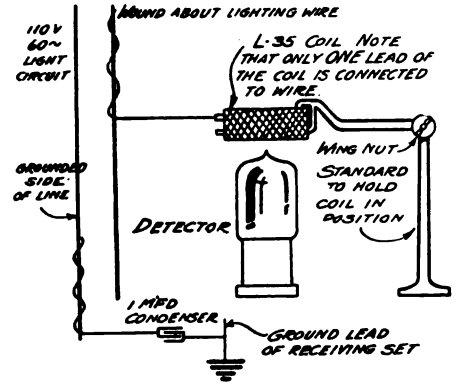
ELIMINATING INDUCTION

721 E. Kingsley St.,
Detroit, Mich.

Editor, QST—

Here goes to clutter up your editorial sanctum with another hook-up. Prepare to add one more to the million or so. This is to eliminate our old friend power, or rather lighting line, induction. It is my great jov to have my long one-wire receiving aerial paralleled for thirty feet by the lighting wires from the distributing pole in the alley.

The hook-up below will illustrate the idea better than I can tell it. There is only one connection to the receiving set proper, and that is to the ground lead. Don't ask me how the blooming thing works, but it does. I think that I have an idea but I won't theorize as I would only



get my bulbs jammed. The main idea is to place the honeycomb coil in such a position that it comes over the detector bulb. By moving it up and down while listening in, some spot will be found at which the hum of the light line is eliminated (about an inch above bulb in my case). The condenser used is an old 1 mfd. telephone condenser.

If any amateur gets results with this method or has anything to better it, I would like to hear from him, as this induction is second only to QRN at my shack.

Yours truly,
G. E. Mears.

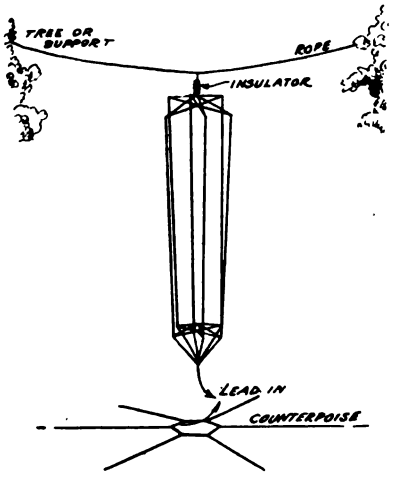
COMMENT ON MR. PHELPS' LETTER RE FAN AERIALS

2020 First St., N. W.,
Washington, D. C.

Editor, QST:

I have studied the aerial system suggested by Mr. Phelps in the November QST and have come to the conclusion that he has not quite hit the mark

We all strive for a high total current in the aerial. To get this we must cut down the resistance by having equal current distribution thruout the antenna system. Mr. Phelps has not taken into consideration the skin effect, due to the group of wires in one plane, which will cause more current to flow in the outer wires than in those nearer the center.



This effect is caused by the mutual inductance of the wires of the fan, the outer wires being subjected to less induced counter emf than those nearer the center. Consequently, the fan has a higher resistance and the total current is cut down.

None of the three remedies suggested by Mr. Phelps would overcome this difficulty. I agree that all of the wires should be of the same length and also partially agree with the two-wire-diverging-upward antenna suggested by Mr. West. However, the average amateur is not able to get the great height which Mr. West's antenna calls for. Why not, then, construct an antenna combining these features. It is

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not as hard as intimated and certainly should be even more efficient.

An inverted cone or conical cage will have all of the wires equal in length, will have equal current distribution with the corresponding decrease in resistance, and will be nothing more or less than several of Mr. West's two wire fans having coincident axes and meeting each other at equal angles. Such an antenna has the added advantage of being symmetrically placed with respect to the ground and makes it possible to build a counterpoise symmetrically about the base.

The illustration may make this a bit clearer.

Very truly yours,
Harry L. Strang, 3IL.

1322 Kearney St. N. E.,
Washington, D. C.

Editor, QST:

I venture to comment on the letter of Mr. Phelps regarding fan antennae.

I have noted with interest the excellent results reported at various times by the users and enthusiastic promoters of this type antenna and without any attempt to in any way discredit their claims am responding to your invitation for comments by pointing out at least one condition where this type antenna can be made to fill a place that other types will not.

Granting 9ZT that it is probably advantageous and desirable to follow out a plan of proportioning of lengths and spacing, it seems to me that a more important issue in determining the effectiveness of the system as a radiator has been overlooked. One of the factors on which the received current from an antenna depends directly is its effective height. The effective height of an antenna system, I believe, is defined not as the upper extreme of the conductors but as the center of capacity of the elevated network. An aerial system may be considered as a condenser plate of area equal to the area enclosed by the outside wires, and the center of capacity as the center point of this area. It is obvious that with two poles of a given height a higher center of capacity can be obtained by means of a flat top than by the fan arrangement. Usually the amateur and experimenter are limited in their facilities for erecting and maintaining supports in excess of from 50 to 60 feet, but when some of the more fortunate are blessed with some form of support at a height of 100 feet or more they are faced with the problem of keeping within 200 meter limits if the full height of the supports is taken advantage of. Here is where the fan type antenna comes into its own and offers a splendid opportunity to get a system of relatively large capacity and a center of capacity of good height.

Remembering that the current which can be forced into a condenser at a given voltage increases with the capacity, and that the greater the amount of space that can be stressed by the radio frequency potentials, the more powerful are the waves that are radiated, it will be seen that an aerial system of largest capacity available within reasonable limits is desirable.

Now, let's move the capacity out of the limelight, and see if there are not good reasons for more than two wires in the fan arrangement.

Considering the antenna to be free to oscillate at the period to which it is tuned without undue interference from the primary circuit of the oscillating transformer, which is the case where a good gap and loose coupling is used, the main factor that determines the sharpness of resonance in the antenna circuit is its resistance. The greater the resistance the broader the peak of the resonance curve and the less sharply tuned will be the radiated signals.

I cannot see how the addition of wires in a fan to a reasonable spacing would seriously affect the high frequency resistance and they would certainly decrease the D.C. resistance. I think it quite safe then to state that their addition should not prevent the antenna from being tuned to a degree of sharpness comparing favorably with only two wires.

Thre is another and better quality of several wires vs. two wires in this arrangement for when a wire is strung up vertically from the earth to a height of 100 feet or more, its inductance adds to its fundamental wavelength faster than its capacity and as each additional wire is put into the fan within the limits of the two on the outside the inductance is decreased, while the increase in capacity is slight, for the capacity of an antenna varies approximately as the square root of the area, which in this case is not changed.

I had the opportunity some time ago to make measurements on different antennae erected at the Bureau of Standards, which bring out plainly the manner in which inductance of leads to an antenna or wires in a fan add to the antenna fundamental faster than their capacity.

Details of the measurements follow:

"L" antenna, one down-lead from each wire and formed into a rat-tail 3 ft. below the flat top.
Masts, 102 ft. high.
Masts, distance between, 100 ft.
Antenna approximately, 95 ft. high.
Flat top, 75 ft. long.
Fundamental wavelength, 294 meters.
Capacity, .000635 mfds.
H. F. resistance, 7.5 ohms at 340 meters.

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Same as above with single wire down-lead.

Fundamental wavelength, 311 meters.
H. F. resistance, 9.3 ohms at 355 meters.

Fan antenna, 5 wires formed into a rat-tail 50 ft. from the top.

Masts, 102 ft. high.
Fan spread at top, 60 ft.
Fan height at top, 95 ft.
Fan number of wires, 5
Fundamental wavelength, 225 meters.
Capacity, .00049 mfds.

Same as above with 9 wires in place of 5 and distance from top to where wires form rat-tail, 65 ft.

Fundamental wavelength, 205 meters.
Capacity, .000621 mfds.
H. F. resistance, 7 ohms at 283 meters.

The latter data on the fan type antenna show how the full height of the 100 ft. masts was taken advantage of, keeping the fundamental wavelength at 205 meters against the 294 meters fundamental of an "L" type on the same masts.

One last comment on the fan. Let the point where the wires are rat-tailed together be as far above the earth as possible and still retain the desired capacity, so that the center of capacity of the network will be well aloft.

In conclusion, would make this classification:— Flat top antennae for low supports and fan antennae for the high ones.

Yours truly,
W. Hollis Hoffman.

416 Court House,
Minneapolis, Minn.

Editor, QST:—

As far as I have been able to determine the general consensus of opinion seems to be in favor of what I wrote in my last letter in November QST dealing with Fan Aerials. This was not a comparison of the fan with any other type, as some have considered it, but just a suggested improvement on the fan as it is commonly constructed to-day. I left the choice of types entirely up to the individual depending upon his local conditions. This phase of the subject is covered in the excellent letter from Mr. Hoffman.

In the letter from Mr. Strang he says I neglected the skin effect and that more current flows on the outside wires. Well, what of it? If you made a two wire vertical fan with the wires widely diverging and then added more wires between, it is true the skin effect would be more but the current in the outside wires would be somewhat less for the same current input. I don't see how simply equality in current distribution cuts down the resistance. The skin or "self-repulsive" effect is not desirable but by bringing nearer together all the wires of a fan and making a vertical cage with equal current in each wire, its use as an antenna has depreciated. Except for increased conductivity, I do not believe a cage antenna much better than a single wire unless the cage is made quite large. Furthermore, the center of capacity of a vertical cage is lower than that of a fan on the same supports. If made conical to any great extent it would require many towers, which would be out of the question.

Mr. Hoffman's letter covers the choice of types of antenna and the factors that go to make up its fundamental wave length in a manner we have been looking for. His experimental data is most interesting and convincing and the only comment I have is, "Why didn't someone give us this dope before?".

It is hard to say what an amateur station will look like in twenty-five years from now but it is certain many things we have now will be obsolete. If my last letter had been entirely in the wrong I would have considered it of some value if it had set amateurs to thinking. Those letters from Mr. West and Mr. Washington caused more searching after technical information among amateurs than anything I have seen for quite a while. Let's have some more like that.

With the best of 73's,
Boyd Phelps.

Brooke, Va.

Editor, QST—

I note a letter from Mr. Phelps in the November QST on aerial design, and while I am not much a believer in "theory" as applied to amateur radio, Mr. Phelps' arguments are certainly good and worth considering by anyone using the fan type of aerial.

I cannot speak for or against any type of aerial when it comes to transmitting, but for receiving the aerial certainly plays an important part, and regardless of theory or what others may say I am firmly convinced that an aerial with a natural period far in excess of 200 meters will bring in more and stronger signals than aerials whose natural period is 200 meters or less. As I have stated before the height plays an important part in selecting various localities and an aerial may be so designed that stations close to you will be heard very indifferently, while distant stations will come through in grand shape. This situation can be reversed by a change in the aerial, but it should be understood that what will give one result at one station may give the reverse at another in a different locality and the only thing to do is to try out different aerials until the desired results are obtained.

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However, we are all desirous of receiving as many stations as possible and hardly wish to give up one group to receive another group. We are all more or less familiar with the fact that an inclined wire will receive from stations in the direction of its inclination many times better than from any other direction, and that the longer the wire the greater the directional effect; or stated in another way, the more gradual the incline of the wire the greater the directional effect. To the best of my belief this principle is one of the causes of the popularity of the vertical fan aerial today for amateur use, as usually the fan aerial is not truly vertical but has an inclination in one direction and the separate wires are also inclined, depending upon the distance between poles, giving three general directions of inclination—or two if the aerial happens to be a true vertical one.

It appears to me, and my beliefs stand up remarkably well in actual results received, that we could turn this fan aerial upside down and add a few more wires, making the umbrella type of aerial. This type of aerial only requires one tall mast instead of two for any other type. There is very little strain on it, reducing the chances of a breakdown, as the aerial wires themselves act as supports. If the wires are long the directional effect is quite pronounced and 8 wires radiating from the mast in different directions should make an aerial capable of receiving from practically all directions with equal ease.

Furthermore it appears from experience that the 8 wires should not be spaced equal distances apart but should run in pairs, each pair being separated some distance at their base, with their base connected together just like any other free end aerial. This in effect would give four two-wire aerials (providing the leads are brought in separately) each aerial being best suited for receiving signals from the direction of its lowest end. A switching arrangement to cut in all or any of these separate aerials for different directional effects should go a long way towards a simple selective system for stations in different directions.

The principle of receiving with this type of aerial is on the same order as described by Mr. Mathews on page 14 of the June 1920 QST insofar as the directional effects are concerned.

After considerable trial experiments I am convinced an aerial of this kind is very suitable for general reception and am arranging to erect a permanent aerial of this type some 80 feet high and will let you hear what results are obtained with it.

Sincerely,

A. L. Groves.

DO THEY HAVE QRM IN ELMIRA?

Dear Editor QST:—

Will you pleas print this O'bichary notis in your valuable magazin in the want colom like "Whose Who"?

I was over to Elmira the other evenin to the Amateure show called "Ho Ho Cindy" and their was a performer in the show, the Stage Manager, who called himself Mr. Hulligan or somethin like that.

Well, when the curtin riz, the sene was like the Amsterdam Theter in NYC and full of show girls. Some of 'em were chewing gum and chewing the rag with each other and this Manager did a lot of cussing and shuting at them 'cause they wernt actin right.



L. O. Adams, 8QM

Now I was trying to see whether he wasn't reeley Irish or not cause his note and pitch (gab) sounded like he was to me. So I Looked on my programm to see who the guy was. Well, cross the page oposit the Stage Manager it said "Louis Adams", so reckoned it was his real name. Spose his folks was called O'Adams before they kum across. Gee, he is gettin high-toned (Clapp-Eastham), so he drops the O. Now if that's the case Ide call him pretty poor Patch Irish, for I'm Irish and proud of it to. "O" for me every time. And "Oh! Oh! Cindy".

Reckon, Mr. Editor, if you'd seen that

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show you'd say he was some actor. Pretty soon he came out on the stage looking like the picture I am sendin you in the mail marked X in the score card.

Then he was called a Fairy God-Mother on the bill of fair. Hully Gee, you should have seen him; looked like anything to me but a mother. His part as a God-Mother was full of action from start to finish. Spose the man what wrot the show made it that way so he wouldn't catch cold.

There were two girls sat right in front of me and they were makin all sorts of remarks about the actors and their actin. One said to the other, "Isn't he just swell?" "S-W-E-L-L?", said the other, Actin' or figure do you mean? Look at them legs; bet he escaped from the Hunger Strikers; wonder who he is any way." "That's Adams, the individual auto mechanic," said a man on her left. Then he added, "He's the man what hears wireless music in the papers."

Now bein' somewhat of a wireless bug myself, that sat me thinking. Reckon, then, he makes his money taking the rattles out of Tin Lizzies to spend wirelessing.

After the show was over, me and my friend sat out to see the village and wound up with a After-Theter Party so it was pretty late when I got back home. Reckon Ide better said early; guss my watch had stopped, as it does some times when the town is too slow. Might have been the cold.

Well, anyway, I was late to work the next morning, and what the boss said to me wouldn't look good in print. I tried to tell him my watch had stopped, and he chirped out "Spose you set it by wireless."

So next night I just sat down to cut in for NAA time sigs (didnt want to get another balling out) and first thing I heard was CQ CQ CQ CQ CQ CQ CQ CQ de 8QM 8QM right thru time signals too. You see my watch was slow. Nuthin the matter of the watch? I forgot to wind it is all. Say he is built on broad lines (his picture don't look it) for you can get him anywhere from 200 to 13000 meters.

I looked him up in the call book and it's the same feller you hear C---Q---ing every night, only hes put his name in the show sheet "Louis" and in the book "Lucius". Might been the printers fault, might been he was making an alaby 'cause he felt a little timid about folks seeing him dressed that way.

We fellows over here (we are not over thirty-five miles from Elmira) decided you'd be glad to show his picture to the boys so theyd know whose who when they heard him.

Say he must be a regular angel. First, cause he is always up in the air. Second, he is always harping on something. Third, he hasn't any clothes. (At least not many in the picture.)

The gang have taken up a collection to buy him a buzzer set to practice on but dont want to hurt his feelings so we arnt going to send it. He might think it a bit suggestive.

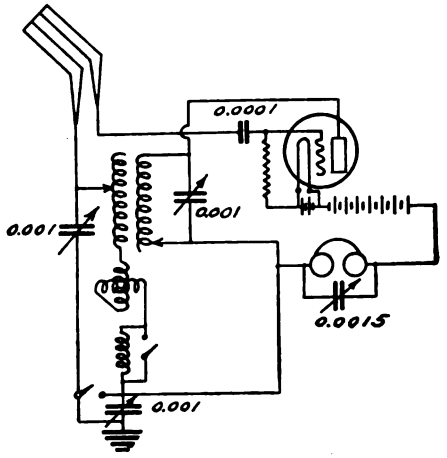
Sig.
Pat McCrittick.

AN UNUSUAL HOOKUP

Apartado 7,
LaBarca, Jal., Mex.

Editor, QST—

I attach a circuit which differs from the ordinary in the connection to grid from the extreme end of the antenna, where the



potential is highest. I have never seen this circuit published. It is particularly sensitive to continuous waves.

Sincerely yours,
Julio Prieto.

THE NUT WITH THE BUG

Walnut Grove, Cal.

Dear Eddie:—

Fellows you can all talk about QRM and its various causes but you have left out the fellow who has a bug, the use for which he never knew, and pacifies himself polluting the ether with mush that he or no one else could ever read. The bug is half the cause of a station calling his friend around the corner ten or more times and signing about that many more, with no less than a half to a one K.W. going out. When a ham starts up the first thing he usually gets is a bug key, and what's more he wants the whole country to know it. Listen to the L.D. fellows and see how many make use of them, although the bug in the hands of a real operator sounds very well. The bug has its place but in the majority of cases it's not in the amateur radio field.

73OM CUL,
J. W. Wise.

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CALLS HEARD

TO increase the value of this department of our QST we will henceforth print more "Calls Heard" and adopt a policy that will result in those printed being fresher and more representative lists. Our members are asked to carefully follow these instructions in reporting calls:

(1) Typewrite or neatly print the calls, "double-spaced", on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

If you will co-operate with us in this, no calls published will be over two months old, and their value will be greatly increased in that we can keep tab on how improvements in our transmitters are working out, etc. It will be our aim to publish representative lists, equally distributed over the country; and in general to conduct this department so as to be of the highest possible service.

We are awfully sorry, fellows, that we can't print all the lists received, but it just can't be done. We know what a job it is to get up a list, and we certainly appreciate your kindness. Now help us to get them published by making yours comply with the requirements. We will be obliged to disregard any that do not follow instructions—in fairness to the other fellow.

We thank you.

HEARD AT SEA

WKOU reports, 100 miles south of Tampico, Mex., Dec. 22 to Jan. 6: 2RK, 3VV, 5BI, 5BM, 5CA, 5CG, 5ED, 5EJ, 5EF, 5ER, 5ES, 5EW, (5DW), 5CM, (5FL) 5FR, 5GC, 5HY, 5HL, 5IR, 5IS, 5JA, 5JB, 5JD, 5JG, 5JN, 5JI, 5JX, 5ON, 5YH, 5ZA, (5ZC), 5ZF, 5ZG, 5ZK, 5ZL, 5ZP, 5ZS, 5ZX, 5XA, 8FT, 8XK C.W., 8ZR, 8ZY, 9AP, 9CA, 9EE, 9EQ, 9FU, 9HI, 9HR, 9JN, 9KO, 9KV, 9LM, 9LQ, 9LR, 9MC, 9NJ, 9OE, 9OR, 9OX, 9ZB, 9ZC, 9ZW, (9HN), 9AAC, 9AEG, 9AEQ, (5ZU).

KUNC heard 3VV, 8DI, 8ZY, 9JQ, in Mobile harbor on galena, Nov. 13.

KULL on Oct. 28, off north Florida, reported 8DX, 8NI, 8DI, 1HAA, 1AW, 9LR calling 8DI.

Ex-6HI, off Nicaragua, 1400 miles south New Orleans, Dec. 9, 5ZC, 5AQ, 5XA, 5BJ, 5EJ, 5BM, 5ZP, 5JA, BCO, 9LR.

Operator S.S. "William Green", Tampico, Nev. 18, 9LR, 9AEG, 9AKC, 9HI, 9RV, 5XD, 5YH, 5ZN, 5ZA, 5FL, 5BI, 5ZC, 5BC, 5DW, 5GA, 5ZP, 5CG, 5XA. Dec. 3, lat. 4:00:00 n., long. 42:25 w. (2712 m. from New York): 2RK. While 150 m. north of Orinoco River, 9AEG very QSA. While 200 m. east of Trinidad, 9AEG, NSF, 9LR. Again at Tampico, 1AR on straight C.W.

Another operator, off Isle de Pinos, Cuba, Dec. 23 nd 24, reports: 4BK, 5BI, 5HL, 5WN, 5XA, 5YH, 5ZN, 5ZS, 8FI, 8HR, 8IN, 8JF, 8KP, 8ZC, 8ZY, 8AKV, 8ANO, 9AP, 9EQ, 9HI, 9JN, 9JQ, 9KV phone, 9LM, 9LQ, 9MC, 9MH, 9VZ, 9WZ, 9ZN.

S.S. "Ellis", at Tela, Honduras, Dec. 24 to Jan. 22: BCO, 2JU, 2RK, 4AT, 5AJ, 5AO, 5CG, 5EA, 5EJ, 5EO, 5FL, 5HL, 5JE, 5XA, 5XB, 5XC, 5YE, 5YH, 5ZA, 5ZC, 5ZF, 5ZP, 5ZU, 5ZX, 8HH, 8JJ, 8ZL, 9AP, 8AAC, 9AEG, 9CA, 9EQ, 9JN, 9LR, 9OE, 9ZA, 9ZB, 9ZE, 9ZJ, 9ZL, 9ZN. No QSS. 9AEG regularly loudest.

KDEV in Tampico, Nov. 25: 5XB, 5ZG, 5ZZ, 9XM, 9LA. Jan. 12 in Galveston Bay: 5YE, 5EA, 5ZE, 5XB, 9YW, 9HN, 9XJ, 9YD, 9YY, 9YA. Jan. 11, 152 m. south of Galveston, 5XB phone QSA.

1NAQ, HARTFORD, CONN.—December.

1AZ, 1BM, (1CK), 1CZ, 1DY, 1EA, 1EK, (1FQ), 1GM, 1GW, 1GY, 1JN, (1JQ), 1JZ, 1OE, 1QN, 1RZ, 1SZ, (1TS), 1UJ, 1WP, 1XE, 1XF, (1XT), 1XX, 1CAS, (1DAP), (1BBL), 1EAV, 1FAQ, 1GBC, 1GBT, 1HAA, 1JAP, 1HBP, 1KBT, 1MAW, 1UAV, 1UAW, 1VAO, 1RAY, 2BB, 2BG, 2CC, 2CO, 2CT, 2DA, 2DF, 2DH, 2DN, 2DS, 2EL, 2FC, 2FG, 2GO, 2GR, 2HG, (2HN), 2IW, 2JU, 2MP, 2OA, 2OB, 2OM, 2RK, 2RM, 2TF, 2UC, 2WP, 2XF, 2YM, 2ZD, 2ZL, 2ZM, 2ACM, 2ARW, 2CY, 3BG, 3BH, 3BK, 3BZ, 3CC, 3CS, 3DH, 3EN, 3GO, 3HB, 3HF, 3HJ, 3IN, 3KU, 3PU, 3SH, 3VV, 3ZE, 3HK, 3XF, (3ABC), 4AG, 4AL, 4CU, 4EK, 4YB, 5AK, 5HL, 5DA, 8AM, 8BA, 8DC, 8DH, 8BP, 8DP, 8DR, 8DT, 8DV, 8ER, 8FB, 8FJ, 8FN, 8FT, 8GA, 8GI, 8GN, 8GO, 8GR, 8GT, 8GW, 8HA, 8HG, 8HM, 8HP, 8HQ, 8HY, 8IC, 8ID, 8IN, 8JF, 8JJ, 8JU, 8KG, 8GZ, 8LF, 8LQ, 8ML, 8MU, 8MZ, 8NZ, 8QJ, 8QM, 8RI, 8RK, 8RW, 8SP, 8WX, 8WY, 8XE, 8XM, 8XU, 8XK, 8ZA, 8ZD, 8ZI, 8ZJ, 8ZL, 8ZR, 8ZT, 8ZV, 8ZW, 8ZY, 8ZZ, 8ABG, (8ACF), 8AFB, 8AKA, 8AMZ, 8ARW, 8AJW, 9AA, 9EE, 9ET, 9FN, 9AP, 9HZ, 9KV, 9LM, 9UU, 9ZJ, 9ZL, 9ZN, BCO, NSF, WWV, XF1.

1TS, BRISTOL, CONN.—December.

1AAG, (1AE C.W. & Spk.), 1AN, 1AS, 1AU, (1AW), 1AZ, 1BAB, 1BAY C.W., (1BBL), 1BC, 1BL, 1BM, 1BP, 1BU, (1CK), (1CM), (1CZ), 1DAP, 1DBU C.W., 1DR, (1DY), (1EAS), (1EAV), (1EBW), 1EK, 1EN, 1EP, 1ES, 1EZ, (1FAQ), 1FBF, 1FBK, 1FF C.W., 1FV, 1FW, (1GAI), 1GAW, 1GAX, 1GBC, 1GBT, 1GJ, (1GM), (1GY), (1HAA), 1HAF, 1HAK, 1HAX, 1HBP fone, (1IA), (1IBD), 1JAP, 1JAR, (1JBF spk., C.W. & fone), 1JBG, 1JBJ, (1JQ), 1GAQ, (1KAZ spk. & C.W.), (1LAX), 1LAY, 1MAD, 1MAI, 1MB, 1MX, (1NAQ), (1NAT), 1NO C.W. & fone, 1OAD, (1OE), 1OJ, 1OW, 1PAO, (1PG), 1QN, 1QR C.W., 1QT, 1RAY, (1RU C.W. & fone), 1RV, (1RX), (1RZ), 1SH, (1SZ), (1TAZ), 1UAW, 1UD, (1UJ), 1UL, 1UQ, 1VAA, (1VC fone), 1WAP, (1WJ), 1WP, (1WR), 1XD fone, 1XE spk. & fone, (1XT), (1XV C.W. & fone), (1XX C.W.), 2AAX, 2AB, 2ABM, 2ACC, 2ACD, 2ACM, 2ACW, 2ADP, 2AEF, 2AEG, 2AEI, 2AJW, 2AM, 2ANZ, 2AQL, 2AR, 2ARA, 2ARB, 2BAD, 2BB, 2BED, 2BEH, (2BG), 2BGR, 2BK, (2BM), 2BO, 2CC, 2CI, 2CS, 2DA, 2DI, 2DK, 2DN, 2DS, (2EL), 2FS C.W., 2GM, 2HN, 2HX, (2HZ C.W.), 2IN, (2JJ), (2JN), 2JU, 2JZ, 2KY C.W. & fone, 2LO, 2ME, 2MM, 2MP, (2NN),

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(2OM), 2OX, 2PF, 2PL, 2RB, (2RK), (2RM), 2RV, 2SZ, (2TF), 2TS, 2UE, 2UK, 2VA, 2VZ, (2WD C.W.), 2XK, 2XJ fone, 2XJ 4 fone, 2XQ spk., C.W. & fone, 2ZC, (2ZD), 2ZL C.W. & fone. 2ZM, 3AAG, 3AB, 3ABC, 3ACS, 3AIS, 3AHK, 3AXC, 3BF, 3BG, 3BH, 3BZ, 3CC, 3CL, 3DC, 3DH, 3DK, 3DR, 3DS, 3EN, 3EV, 3FG, (3FM), 3FN, 3FR, 3GL, 3GO, 3GX, 3IW, 3HG, (3HJ), 3HX, 3JC. 3KM, 3LP, 3OB, (3PU), 3QL, 3QV, 3QW, 3RW, 3SW, 3TJ, 3UC, 3UF, 3UX, 3VV, 3ZA, 4XB C.W., 8AAV, 8AB, 8ACF, 8AFB, 8AFO, 8AHH, 8AJB, 8AJW, 8AKA, 8AL, 8AMF, 8AMQ, 8AMZ, 8ANJ, 8APB, 8ARK, 8ARW, 8AY, 8BO, 8BP, 8BV, 8CF, 8CG, 8CV, 8DC, 8DI, 8DR, 8DT, 8DV, 8EC, 8EV, 8FI, 8FK, 8FT, (8FW), 8GI, 8GH, 8GW, 8HA, 8HF, 8HI, (8HP), 8HY, 8ID, 8IEP, 8IL, 8IN, 8IV, 8JF, 8JJ, (8JS), 8NI, 8NZ, 8PN, 8PQ, 8PU, 8QB, 8QJ, (8QM), 8QQ, 8RQ, 8SH, 8SP, 8TB, 8TT, 8UK, 8VJ, 8VQ, 8VS C.W., 8WO, 8WY, 8XE, 8XH, 8XI, 8XK C.W. & fone, 8XR C.W., 8XU C.W., 8ZA, 8ZD, 8ZE, 8ZG spk. & C.W., 8ZL, 8ZP, 8ZR, 8ZS, 8ZT, 8ZU, 8ZV, 8ZW spk. & C.W., 8ZY, 8ZZ, 9AAC, 9AAV, 9AAW, 9AEG, 9AK, 9AP, 9CA, 9CW, 9EQ, 9GP, 9GS, 9HR, 9JN, 9JQ, 9JT, 9LM, 9LQ, 9MH, 9OE, 9OR, 9UH, 9XI C.W., 9XM spk., C.W. & fone, 9YB, 9ZJ, 9ZL, 9ZN spk. & C.W., 9ZQ.

1KAY, PORTLAND, ME.—Oct. 10 to Dec. 18

1AE (C.W.), 1AK, 1AW, 1AZ, 1BAB, 1BAC, 1BBK (Fone), 1BBL, 1BM. 1BS, (1CAO), 1CAY, 1CBX, 1CK, 1CM, 1CZ, 1DQ. 1DU, 1DY, (1EAV), (1EAX), (1EK), 1FBF, 1FBS, (1FM), (1FV), 1FZ, 1GBC, 1GBL, 1GBT, 1GM, 1GY, 1HAA, (1HAK), 1JAP. 1JBI, (1JBJ), (1KBJ), 1LAX, 1NH, 1OA. (1OE), 1OT. 1PAC. (1PAO), (1PAW), 1PU. 1PY, 1RAY, 1RV, 1SL, (1TS), 1UAW, (1UL), (1UQ), (1VY), 1WAP. (1XT), 1XE (phone), 1XX (C.W.), 1XD (phone), (1YD), 1ZD, 2AB (phone), 2ADD, 2AEF, 2AER, 2AFZ, 2AHK, 2AJN, 2AK, 2AM, 2AR, 2BB, 2BF, 2BG, 2BH, 2BK, 2BL, 2BM, 2BT, 2CS, 2CT. 2DA 2DH, 2DN, 2DR, 2EH, 2EL, 2GO, 2BR, 2HG, 2HX, 2JJ, 2JN, 2JU, 2JZ, 2KE, 2KY (fone & C.W.), 2NV, 2OA, 2OM, (2OO), 2RL, 2QR, 2RB, 2RK, 2RV, 2SH, 2TF, 2TG. 2UC, 2UE, 2WB, 2WM, 2XI (C.W.), 2XX (C.W. & phone). 2ZC. 2ZD. 2ZL (C.W.), 3AAP, 3ABD. 3BE, 3BG, 3BH. 3BQ, 3BZ, 3CC, 3CS, 3DH. 3EH, 3EL, 3EN, 3FB, 3FR, 3GO, 3HG, 3HJ, 3KM, 3MO, 3ND, 3PU, 3VV, 3VW, 3ZA, 3ZE. 3ZW. 4AL, 4EN, 4DM, 4KM, 5DA, 5XA (C.W.), 5ZL, 8AB, 8AC, 8ACF, 8AEA, 8AG. 8AMQ, 8ANJ, 8AY, 8DP, 8CB, 8CJ, 8DC, 8DI, 8DK, 8DP, 8DR, 8DV, 8DY, 8ER, 8FK, 8FT, 8FW. 8GI, 8GW, 8HG, 8HH. 8HP, 8ID. 8II, 8IK, 8JF, 8JJ, 8JS, 8KE, 8KM, 8KP, 8LB, 8MG, 8ML, 8MT, 8NI, 8QJ. 8QM. 8QX. 8RI. 8RT, 8RW. 8SH 8SP, 8TB, 8TTQ, 8WY, 8XK (BM & fone), 8XU, 8ZA, 8ZD, 8ZE, 8ZG, 8ZL, 8ZO, 8ZX, 8ZL, 8ZZ. 9AU. 9BW, 9FG 9FN. 9FV. 9GN, 9HR, 9JN, 9LC, 9LM, 9LQ. 9LZ. 9LQZ. 9UH. 9UM, 9UU, 9XM, 9ZJ, 9ZL, 9ZN. Canadian 2CI (ex 3Z)) NSF, (phone, C.W. & BM), WWV.

1HAA, MARION, MASS.—December

1AK, 1AW. 1BS. 1BBL, 1CK. 1CM. 1CY, 1CZ, 1CAY, 1CBC, 1DT (C.W.), 1DY, 1AV, 1EK, 1ES, 1FV, 1FBF, 1FBV, 1GY, 1GZ, 1GM, 1GBC, 1HO, 1IBV, 1JAP, 1JR, 1JAR, 1JBJ, 1JBT. 1MAD, 1OE, 1OZ, 1QAV, 1RV, 1RZ, 1TS, 1UD, 1UL. 1UE, 1WR, 1XD, 1XT, 1XX, 1ZK. 2AM. 2AR, 2ANZ. 2ARY, 2ABM, 2AER. 2BK. 2BO, 2BM. 2BB, 2CP, 2DA, 2DN. 2EL, 2HN. 2HZ, 2HX, 2JU, 2JZ, 2JN, 2KY (C.W.), 2TF. 2OA, 2RK, 2ZD, 2ZH. 2XX, 3ABD, 3ACM, 3ACS, 3CC, 3DH, 3EN, 3GX, 3HJ, 3HX, 3KN, 3OB, 3PU, 3QF, 3VV. NSF, (4CM). 4LL, 4YB, 5AO, 5ZP, 8AL, 8AMZ, 8BC, 8DY, 8EC, 8FK, 8GI, 8HP, 8ID, 8JS, 8JF, 8JJ, 8KP, 8KZ, 8LM, 8ML, 8MZ, 8NI, 8SP, 8TT, 8RZ, 8WY, 8VJ, 8ZD, 9OX, 9ZN.

2XQ, SCHENECTADY, NEW YORK
Nov. 15 to Jan. 1st.

(1ARY), (1AW), 1CJ, (1CK), 1CM, 1CZ, 1EAV, (1EBW), 1EP, 1GM, 1GY, (1HAA), (1JAP), (1JQ), (1OE), 1OO, 1OW, (1RAY), 1SHZ, (1TS), (1XX), 1YA, 2ACM, (2AIF), 2ALK, 2AM, 2ANJ, 2ANM, (2AWF), (2AZP), (2BB), (2BK), (2BM), 2BO, 2CC, 2CT, 2DA, (2DN), 2GR, 2HX, (2JJ), 2JU, (2JZ), 2OA, 2OU, 2PV, 2RK, 2RV, (2SZ), (2TF), (2XA) fone, 2ZD, 2ZL, 2ZM, 3AFF, 3ABC, 3ABD, 3ACM, 3AH, (3AHK), 3AK, 3APP, 3AR, (3BG), 3BZ, 3CC, 3CS, (3DH), 3DV, 3EH, 3EN, 3FB, 3FJ, 3FR, 3GO, 3GV, 3HJ, 3HX, 3IX, 3MC, 3OB, (3OU), 3UC, 3VV, 3XF, 3ZA, (3ZS), 4YB, 4CP, 4DM, 8AB, 8ACF, 8ACH, 8AGW, 8AHH, 8AHK, (8ANJ), 8ARW, 8BP, 8BV, 8CG, 8CZ, (8DR), 8DV, (8FD), 8FK, 8FV, (8HA), 8HG, (8HP), (8HR), 8GE, 8GI, 8ID, 8IK, 8IN, (8JF), 8JJ, (8JS), 8JU, 8JX, 8KE, 8KM, 8KP, 8LB, 8LF, 8LG, 8LQ, 8LZ, 8NI, 8NZ, (8OI), 8PN, 8RQ, 8RY, 8SP, 8SW, (8TB), 8TD, 8TN, 8UI, 8WO, 8WY, 8XE, 8XH, 8XK (ICW & fone), 8XM, (8XU), 8ZB, 8ZD, 8ZE, 8ZG, (8ZL), 8ZR, 8ZV, 8ZW, (8ZX), (8ZY), (8ZZ), 9AU, 9AAC, (9AAV), 9AAW, 9ABL, 9AJI, 9AW, 9EE, (9FG), 9HR, 9JN, 9JQ, 9LQ, 9LM, 9MH, 9XM, 9YM, 9ZJ, (9ZL), (9ZM), (9ZN), NSF.

HEARD AT 2EX, RUTHERFORD, N. J.
Nov. 15th to Jan. 23.

1CK, 1DR, 1DY, 1JQ, 1OE, 1XT, 1BAB, 1BBL, 1HAA, 1HAF, 1HBZ (C.W.), 1OAL, (C.W.), 1XX (C.W., 3AB, 3CK, 3DH, 3GO, 3PW, 3VV, 3QW, 3XF, 3XG, 3YV, 3ZE, 3ACS, 3AHK, 4BZ, 4CP, 4XB (C.W.), 5DA, 8DE, 8FD, 8GT, 8HA, 8IK, 8IV, 8JF, 8JP, 8LM, 8LQ, 8QG (C.W.), 8SH, 8SP, 8UD, 8WY, 8XE, 8XK, 8XS, 8XU, 8YG (C.W.), 8ZG, 8ZR (Spk. and C.W.), 8ZW, 8ZV, 8ZY, 8ABG, 8ALE, 8ARW, 9ZJ, 9ZL, 9ZN, 9AWX. Phone stations 1OAU, 2DF, 2FZ, 2GF, 2IA, 2IC, 2KY, 2MC, 2QR, 2RU, 2SS, 2TT, 2VK, 2WD, 2WN, 2XC, 2XF, 2XJ, 2XK, 2ZD, 2ZL, 2ZM, 2ABA, 2ABR, 2ABZ, 2ACI, 2ACP, 2AJF, 2ALR, 2ALZ, 2ANX, 2AQF, 2ARA, 2AVR, 2AWL, 2AWM, 2AXB, 2AYZ, 2BEA, 2BGA, 2BGM, 2BHR, 2BHN, 8XK, 8ZW, NSF.

3AAS, HAGERSTOWN, MD.—December.

1AW, 1BAB, 1BB, 1BBL, 1CK, 1CM, 1CZ, 1GBC, 1GBT, 1HAA, 1OE, 1TS, 1WJ, 1WR, 2AER, 2AF, 2ALK, 2BB, 2BM, 2CS, 2CY, 2DA, 2DI, 2DN, (2EL), 2HG, 2HN, 2JJ, 2JO, 2JU, 2JZ, 2OO, 2RB, 2RK, 2RM, 2TF, 2UE, 2VA, 2WE, 2ZL, 3ABD, 3ACS, 3BF, (3BH), (3BL), 3BZ, 3EH, 3EN, 3EV, (3GO), 3HG, 3HJ, 3HX, 3LS, 3PB, (3PU), 3RB, 3SF, 3UG, 3VA, (3VV), 3XF, 3YV, 4AG, 4AL, 4AO, 4DM, 4EY, (4YB), 5DA, 8AAU, 8AAV, 8AAW, 8ADE, 8AEE, 8AFB, 8AGB, 8AGM, 8AGO, 8AHR, 8AKV, 8AMQ, 8AMZ, 8ANO, 8AY, 8BV, 8CF, 8DG, 8DJ, 8DV, (8DR), 8DZ, 8EC, 8EZ, 8FG, (8FK), 8FP, 8FT, 8FW, 8GB, 8GI, 8GG, 8GT, 8GW, 8HA, 8HJ, 8HP, 8HY, 8ID, 8IK, 8JF, 8JJ, 8JS, 8KE, 8KK, 8KP, 8LF, 8MC, 8MM, 8MP, 8MZ, 8NG, 8NI, 8NZ, 8OJ, 8OZ, 8QJ, 8QS, 8RQ, 8RS, 8SP, 8TT, 8UK, (8VJ), 8WY, 8XH, 8XU, 8ZA, 8ZE, 8ZL, 8ZR, 8ZV, 8ZZ, 9AAV, 9ABL, 9ACD, 9ADV. 9AEG, 9AJN, 9AOT, 9AP, 9AWX, 9CS. 9EL. 9EQ, 9ET, 9GC, 9GN, 9GS, 9HY, 9JL, 9KV, 9LF, 9LQ, 9MC, 9MS, 9NQ, 9UH, 9UU, 9ZB, 9ZN, 9ZQ, 9ZZ.

3ZA, BALA, PENNA.—December.

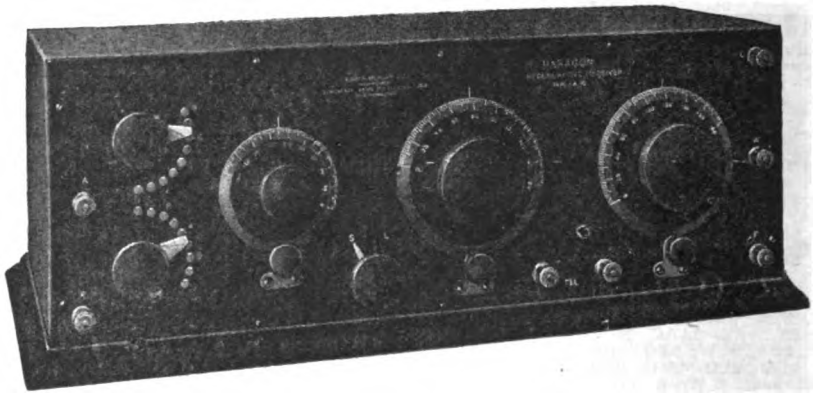
1AW, 1BBL, 1CK, 1CZ, 1DR, 1DY, 1EB, 1EBW, 1GM, 1HAF, 1JQ, 1JAP, 1OW, 1PG, 1PZ, 1RAY, 1TS, 1WZ, 1WAP. 1XT, 2AIM, 2BB, 2EL, 2HN, 2JJ, 2JU, 2OA, 2OU, (2RK), 2TE, (2TF), 2UE, 2XQ, 2ZM, 3AB, 3ABC, 3AES, (3EN), 3GO, 3GX, 3HG, 3KM, 3PU, (3QW), 3UU, (3VV). 4AG, 4AI, 4AL, 5ET, 8AL, 8AP, 8AY, (8AJW), 8AKA, 8AMB, 8ANJ, 8BP. 8CV, 8DV, 8ED, 8FK, 8GI, 8GW, 8HP, 8IL, 8KE, 8LA, 8LF, 8NI, 8OJ, 8QM, 8RQ, 8RW, 8SP, 8TT, 8VJ, 8WY, 8XH, 8ZD, 8ZE, 8ZH, 8ZL, 8ZW, 8ZZ, NSF.

3BZ, DANVILLE, VA.—December.

(1AW), 1AHF, (1BBL), (1CL), 1DY, 1GB, 1IR, 1OE, 1XE, (1RZ), 1HAA. 1RAY, 2AER, (2BB), 2BK, 2BQ, 2DA, 2DR, 2EL, 2GU, 2JU, 2JZ, 2JJ, 2RB, 2RK, 2RZ, 2SZ, 2ZC, 2ZM, 2ZL, 3AAS, 3ABC, 3ABD, 3AHK, 3BB, 3BG, 3DS, (3EN), (3EV), 3EY, (3EH), (3FG), (3GO), 3GX, 3HJ, (3KM), 3OB, 3OF, (3PU), 3RZ, (3VV), (3XF), 3ZE, (NSF), (4AG), 4AN, (4BK), (4BL), (4BQ), (5BY), (4DM), 5XB, 4XC, 4YB, (5DA), 5JD, (5KD), 5XA, 5YB, 5YH, 5ER, 5ZC, 5ZS, 8ACF,

(Continued on page 68)

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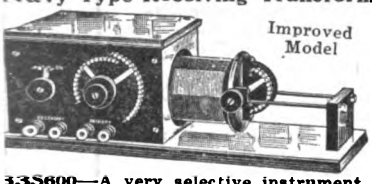


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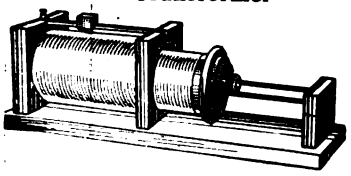
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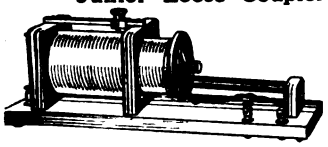
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63S601 — An efficient high-grade, long wave tuner. Has same winding as our Navy type. Will receive all government time stations such as Arlington and Key West. Works up to 4,000 meters. Primary controlled by slider. Secondary inductance varied by a 12-point switch mounted on Formica. Silk covered wire windings. Brass metal parts polished and lacquered. Mahogany finished wood work. Base, 18 inches long; 6 inches wide. Shipping weight, 14 pounds. Price.....$7.90

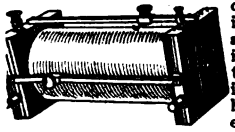
Junior Loose Coupler



63S5103—A fine instrument for 200 to 600 meter work. Primary controlled with slider, secondary by 5 point switch. Metal parts brass, polished and lacquered. Wood-work mahogany finish. Base, 12 x 8½ inches. Ship. wt., 6 pounds. Price..$5.70

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63S5104 — Machine spaced enameled copper wire winding. Non-shrinkable tube. Control is by means of two smooth working sliders. Mahogany finished end pieces. Range up to 1,000 meters on average antenna. Length, 8¾ inches. Ship wt., 4 pounds. Price$3.95



Loading Coil

63S5105—Essentially the same as two slider tuning coil, but has only one slider. Will add about 300 M range to any set. Ship. wt., 3 lbs. Price.....$3.40

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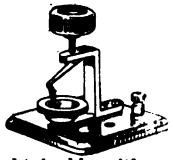
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63S5304 — A detector of correct construction. Permanent adjustment. Galena, silicon and other minerals can be used. Moulded base and adjustment knob. Metal parts of brass, polished nickel finish. Tested piece of silicon included. Base size, 2½x3½ in. Ship. wt., 1 lb. Price.....$1.58

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63S5305 — A popular detector. Tested piece of galena is mounted in cup which can be rotated. Crystal contact of phosphor bronze wire coiled and pointed and set on flat spring. Very fine adjustment obtainable with screw. Moulded base and adjustment knob. Base, size, 3x3 inches. Ship. wt., 1¼ lbs. Price.....$1.43

Murdock Detector Stand



63S5302 — A good low priced detector stand. Will do very satisfactory work. Moulded black composition base. Adjustable cup and contact. Nickel plated binding posts. No crystals included. Size, 2⅝x1½x2 in. Ship. wt., 4 oz. Price.....70c

Detector Crystals



Genuine Arlington Tested Minerals. Absolutely the best crystals that can be purchased for any price. All are thoroughly tested and guaranteed. Extremely sensitive. Packed separately in sealed boxes. Ship. wt., about 3 oz.

63S5320—Supersensitive Galena. Per crystal.....29c

63S5322—Supersensitive Silicon. Per crystal.....29c

63S5324—"Radiocite". Per crystal...25c

Radiotron V.T. Detector

63S5194 —This is a "soft" tube especially suited for detector use and is also an excellent audio frequency amplifier. It produces excellent results in regenerative circuits. Has the familiar hissing point and low B battery potential requirements. Standard four-prong mounting. Ship. wt., 1 lb. Price...

63S5620—4000 ohm potentiometer phite. Often used with soft vacuum tu Semi-circular, 2½ in. diam., ⅜ in. ¼ in. thick copper plated ends. Price

Radiotron Amplifier Oscill



63S5192—A high vacuum a fier and detector. Requires critical adjustment. Designed amplification and undamped w reception by the regenera method. May be used singly receiving continuous waves o cascade as a two or more amplifier. Ship. wt., 1 lb. Price.....$

Socket for Vacuum Tube



63S5342—Socket is mounted on bakelite sheet. Four binding posts for connections. Screw holes for flat mounting, screws in side of base for panel mounting, permitting either right or vertical position of tube. Sh wt., 8 oz. Price.....$1

Improved V.T. Socket



63S5343—Improved long spring contacts insure positi contact on any standard t base prongs. Glossy bl composition base. Nicke tube. Marked screw conn tions. May be used and wired in a position. Ship. wt., 8 oz. Price..$1.

Order direct from these pages. S instructions on second page following this one.

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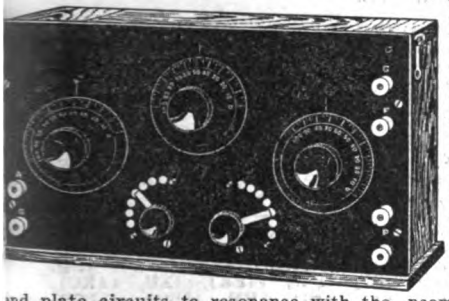
Instructions for Ordering on Opposite Page.

ıse Prices Guaranteed Against Advance Until JULY 1st, 1921.

Our Kansas City Store



Short Wave Long Distance Regenerative Receiver



This instrument makes possible the reception of messages to which other types of apparatus will not respond. The range is from 180 to 600 meters and by the addition of external loaders, such as the inductance coils listed on the opposite page, this range may be raised as desired. Properly handled, signals may be read from stations at extreme distances or through heavy static and interference. The antenna and closed circuits are inductively coupled and the coupling is variable. Regeneration is obtained by tuning both the grid and plate circuits to resonance with the ıncoming signal. Highest efficiency and amplification are obtained by reducing capacity and resistance in circuits to absolute minimum and best regenerative effects are secured by use of properly designed variometers.

The inductive coupler consists of a primary, the inductance of which is varied by two seven point switches, and a rotating secondary by means of which arrangement very fine tuning is possible. Coupler and both grid and plate circuit variometers are fitted with knobs and indicating dials.

A very compact and easily portable instrument. Graduated bakelite panel size, 7¼x13¾ in. Fine cabinet weathered oak finish, 5 inches deep. Metal parts brass. Binding posts black oxidized finish. Ship. wt., 26 lbs.

63S610—Regenerative Receiver. Price.....$33.95

Magnet Wire



For repairing motors, other electrical apparatus, experimental work, etc. One piece only on a spool. Wire is standard B and S gauge. Insulation and wire both perct and uniform. Supplied only on eight spools given.

Double Cotton Covered Magnet Wire Order by Art. No. 63S1350				Enameled Magnet Wire Order by Art. No. 63S1400		
Price 1 oz. Spool	Price 8 oz. Spool	Price 1 lb. Spool	Gauge	Price 4 oz. Spool	Price 8 oz. Spool	Price 1 lb. Spool
....	$0.79	$1.28	16		$0.63	$0.98
....	.89	1.48	18		.65	1.10
....	1.05	1.85	20		.81	1.14
0.78	1.28	2.10	22		.83	1.20
.93	1.58	2.60	24	$0.62	.96	1.25
1.05	1.80	2.95	26	.65	1.02	1.32
1.25	2.10	3.70	28	.68	1.06	1.42
1.48	2.58	4.30	30	.78	1.20	1.48
1.78	3.15	5.40	32	.81	1.25	1.56
1.98	3.70	6.90	36	.96	1.48	1.98

Electrose Insulators



Electrose insulators are the standard in the wireless field. They stand up under all conditions met with. Eyes are wrought iron galvanized. Ship. wt., ⅛ to 2½ lbs.

Article No.	Dia. In.	Ov. all Lgth. In.	Strgth. Lbs. Dry	Elec. Value Volt	Rain	Price
63S5630	2⅛	3¼	250	40,000	25,000	36c
63S5631	1½	4	1,000	40,000	15,000	48c
63S5632	1½	10½	1,000	90,000	50,000	82c

Electrose Wall Insulators



63S5634—Special Wall Insulator for lead in wires. Has hole through body for wire. Body diam., 2 in. Length over all, 5⅞ in. Ship. wt., 1 lb. Price.....96c

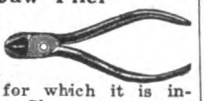
Sharp Nose Side Cutter Plier



A high grade Hardened Steel Plier. Used a great deal on all electrical work. Handy around any work shop. Ship wt., 6 oz.

63S5802—6-inch Sharp Nose Plier. Price, each.....$1.28

Diagonal Jaw Plier



Best Hardened Tool Steel Diagonal Jaw Sidecutting Nipper. This tool will do perfectly the work for which it is intended. Length, 5 in. Ship. wt., 4 oz.

63S5808—Diagonal Jaw Pliers Price, each.....$1.35

High Grade Pliers

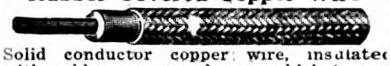
Side cutting Pliers. Forged from best quality steel. A good tool for linemen and electricians. Ship. wt., 4 to 10 oz.

63S5810—5-inch Plier. Price each.....$1.12

63S5812—6-inch Plier. Price, each..... 1.18

63S5814—7-inch Plier. Price, each..... 1.42

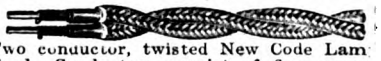
Rubber Covered Copper Wire



Solid conductor copper wire, insulated with rubber compound over which is one cotton saturated braid. Ship. wt., 3 and 13 lbs. per 100 ft. Sold only in lengths listed.

63R3015—Size 14. Price for 25 ft...$0.3
Price for 100 ft..... .1.4
63R3032—Size 6. Price for 10 ft... .6
Per 25 ft....$1.73 Per 100 ft.... 5.8

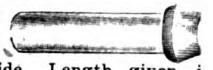
Twisted Pair Cotton Lamp Cord



Two conductor, twisted New Code Lamp Cord. Conductors consist of fine copper wire strands twisted together. Covering is of fine quality interwoven yellow and green cotton. Ship. wt., 6 lbs. per 100 ft. Sold only in lengths listed.

63R3175—Size 18. Price for 10 ft...$0.3
per 25 ft....$0.69 Per 100 ft....$2.6

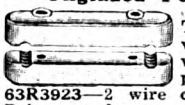
Porcelain Tubes



Unglazed Porcelain Tubes, ⅛ in. inside; ⅛ in. outside. Length given from underhead to end. Ship wt., per dozen, 1 to 2 lbs.

63S3902—Length 3 in. Per dozen..$0.2
63S3906—Length 6 in. Per dozen.. .4
63S3908—Length 8 in. Per dozen.. .7

Unglazed Porcelain Cleats



Take No. 10 or small wires. Have 2½ i wire centers. Ship. wt per dozen pair, 3 lb

63R3923—2 wire cleats. Price per dozen.....$0.3

Solid Porcelain Knobs



New Code No. 5½ solid porcelain knob. Height, 1 1/16 in. Diameter, 1⅛ in. Hole, ¼ in. Groove, 1/16 in. Ship. wt., per 100, 11½ lbs.

63S3927—Per doz.....$0.

No. 4 solid porcelain knob. Height, 1 in. Diameter, 1½ in. Hole, ⅜ in. Groov ⅜ in. Ship. wt., per 100, 20 lbs.

63S3929—Per doz.....$0.

Porcelain Strain Insulator



63S5628—Made of brow glazed porcelain. A stro rugged insulator. De screw ribs. Smooth holed heavy en Ship. wt., 6 oz. Each..7c Dozen..7

Porcelain Entrance Switch



National Electric Code Standard Porcelain Base Entrance Switch or main line cut-out switch. Takes plug fuses. Capacity, 125 volt, 30-amperes.

63S4305—Two-Pole Switch. Ship. w 1½ lbs. Base, size, 3¼x5¼ in. Price, each 8

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CALLS HEARD

(Continued from page 58)

8AEE, 8AKU, (8AKV), 8AY, 8AMQ, 8BP, 8CFN, 8CF, (8DV), 8DZ, 8DP, 8DJ, 8EV, 8EM, 8FI, 8GW, 8GI, 8HG, 8HI, (8HA), 8IN, 8IK, 8IL, 8IZ, 8JJ, 8JS, 8JF, 8KR, 8KZ, (8KP), 8LF, 8LB, 8ML, 8MT, 8NZ 8QJ, 8RZ, (8SP), 8TT, 8UK, 8VJ, (8WY), 8XK, 8XH, 8ZR, 8ZG, (8ZD), 8ZL, 8ZA, 8ZX, (8ZY), 9AK, (9AP), 9AUN, 9AGY, 9AMK, 9ET, 9FG, 9FT, 9FN, 9GE, 9GN, 9GL, 9GC, 9GX, 9HN, 9HR, 9HJ, 9JT, 9JL, 9JQ, 9JN, 9KV, 9LF, (9LQ), 9LT, 9MC, 9NJ, 9NQ, 9OE, 9OR, 9PL, 9OX, 9QM, (9UH), 9UU, 9UK, 9ZB, 9ZN, 9ZJ, 9ZQ, 9ZL, 9ZI.

3CA, ROANOKE, VIRGINIA—December.

1AE (C.W.), 1BBL, 1GBC, 1HAA, 1JS, 1MW, 1RAY, 1RZ (spark and C.W.), 1TS, 1XT, 2AM, 2BB, 2BK, 2DA, 2HN, 2JJ, 2JU, 2OA, 2OM, 2QW, 2TF, 2ZL (phone), 3AAP (dalite), 3ACB, 3ACE, 3ACS, (3AHK), 3BZ, 3CC, 3CM, 3EH, 3GN, 3FA, 3FG, 3GO, 3GX, 3HJ, 3MO, (3OB), 3OC, 3PU, 3XA, 4AI (C.W. and spark), 4AL, 4AO, 4AU, 4BA, 4BK, (4YB), 5AN, (5DA), 5ER, 5YH, 5ZS, 8AB, 8AAG, 8AAU, 8ACF, 8AGB, 8AIB, 8APB, 8AVK, 8AY, 8BP, 8CD, 8CF, 8CH, 8CO, 8DG, 8EC, 8EF, 8EK, 8EV, 8FT, 8GI, 8GQ, 8HA, 8HS, 8ID, 8IN, 8JF, 8JJ, 8JS, 8KP, 8ML, 8MM, 8NH, 8NI, 8OW, 8RQ, 8SI, 8SP, 8TJ, 8TK, 8TO, 8VY, 8WY, 8ZA, 8ZL, (8ZR), 8ZV, 8ZW, (8ZY), 8ZZ, 9ABL, 9AEG, 9AK, 9AMV, 9AOJ, 9BW, 9BY, 9EQ, 9FG, 9FQ, 9FS, 9GS, 9JL, 9JN, 9JQ, 9LQ, 9LR, 9MC, 9MH, 9OE, 9UK, 9WZ, 9ZJ, 9ZQ, 9ZZ.

3SU, WASHINGTON, D. C.—Nov. 15 to Dec. 15.

1AGW, 1AK, 1AW, 1BB, 1BBL, 1BM, 1CK, 1CZ, 1EAV, 1GBC, 1GY, 1HAA, 1JAP, 1JQ, 1OA, 1OE, 1OW, 1PG, 1PQ, 1RZ, 1XT, 2AN, 2AR, 2BB, 2BG, 2BK, 2BM, 2CS, 2CY, 2DA, 2DH, 2DS, 2EL, 2HN, 2JJ, 2JN, 2JU, 2JZ, 2NF, 2PL, 2RK, 2TF, 2UE, 2WB, 2XG, 2ZL, 3AA, 3AAP, 3AAS, 3AB, 3ABC, 3ABD, 3ACM, 3AFG, 3AHK, 3AJ, 3BE, 3BS, 3BZ, 3CA, 3CC, 3CX, 3DH, 3DS, 3EH, 3EN, 3FB, 3FG, 3FM, 3GO, 3HG, 3HH, 3HJ, 3HX, 3KV, 3PU, 3RS, 3SC, 3SW, 3SX, 3TJ, 3VV, 3YV, 3ZA, 4AG, 4AL, 4AO, 4BQ, 4CP, 4DM, 4EY, 4YB, 5DA, 5ER, 5FV, 5KD, 5XA, 5YE, 8AAU, 8ACA, 8ACF, 8ACH, 8ADY, 8AFB, 8AFD, 8AIG, 8AJM, 8AJW, 8AKA, 8AKV, 8AL, 8AMF, 8ANJ, 8AY, 8BP, 8CH, 8CI, 8DM, 8DR, 8DW, 8DZ, 8EF, 8EN, 8FC, 8FK, 8FO, 8FP, 8FT, 8FY, 8GB, 8GI, 8GW, 8HA, 8HF, 8HP, 8HY, 8ID, 8IK, 8IN, 8JF, 8JJ, 8JS, 8JU, 8KE, 8KP, 8LF, 8LG, 8LH, 8LW, 8ML, 8MT, 8MW, 8MZ, 8NL, 8NN, 8NZ, 8OM, 8PN, 8PU, 8QM, 8QT, 8RQ, 8RW, 8SH, 8SP, 8TT, 8VK, 8VQ, 8WD, 8WY, 8XE, 8XK, 8XS, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8ZR, 8ZT, 8ZV, 8ZX, 8ZY, 8ZZ, 9AAF, 9AP, 9BW, 9DV, 9EQ, 9ET, 9FG, 9FS, 9GC, 9GP, 9GX, 9HN, 9HR, 9JT, 9JV, 9KV, 9LF, 9LQ, 9QM, 9OX, 9SS, 9UF, 9UH, 9UU, 9VA, 9ZJ, 9ZL, 9ZN.

4FD, MIDVILLE, GA.,—November.

1AW, 2HN, 2RK, 3AC, 3AP, 3BG, 3BL, 3EH, 3EL, 3EN, 3JU, 3KM, 3WH, 3VV, 3AAP, 4AG, 4AI, 4AL, 4AM, 4AN, 4AO, 4BL fone, 4BM fone, 4BQ, 4CP, 4DA, 4YB, 5AO, 5BY, 5DA, 5EA, 5ER, 5FV, 5LL, 5LP, 5YH, 8AC, 8AY, 8DI, 8DP, 8DR, 8DW, 8ER, 8EY, 8FI, 8FT, 8FY, 8GO, 8GX, 8HA, 8KE, 8LA, 8LD, 8LE, 8LL, 8LN, 8LQ, 8LX, 8LY, 8ML, 8NI, 8OE, 8OX, 8SF, 8TT, 8AAF, 8ACF, 9AP, 9BW, 9DV, 9ET, 9FT, 9GK, 9GN, 9GT, 9GX, 9HA, 9IF, 9LF, 9LL, 9LN, 9LQ, 9LR, 9OE, 9OI, 9UH, 9VS, 9WA, 9ZJ, 9AAF, 9AAW, 9ABS, 9ACF, 9ACN, 9AEG, NSF fone & C.W., KQG fone, 8XK fone.

4CX, WINSTON-SALEM, N. C.
Oct. 1 to Dec. 12.

1BM, 1RK, 1XT, 1XB, 2RK, 2ZM, 2XH, 2ACM, 2EL, 2ZL, 2XQ, 2KF, 2ZR, 2ZH, 2WB, 2HG, 2FG, 2GO, 2XG, 2BB, 2XQ, 2AER, 2KM, 2AR, 2XF, 3KM, 3DH, 3XF, 3UC, 3QW, 3RO, 3GO, 3QV, 3AAG, 3FR, 3HG, 3AHK, 3HB, 3HJ, 3PU, 3SW, 3SM, 3FG, 3PF, 3VV, 3YV, 3TJ, 3HX, 3FM, 3DR, 3EN, 4CC, 4BQ, 4KC, 4XK, 4YB, 4CP, 4AG, 4XC, 4AO, 4DM, 4BY, 4EK, 4DA, 4XB, 4AN, 4BE, 5XA, 5ZL, 5DA, 5YE, 5KD, 5YH, 5XB, 5ER, 5FV, 5ZZ, 5ZG, 5JA, 5ZK, 8XK, 8ER, 8HG, 8RW, 8HR, 8ZG, 8ZW, 8ZA, 8YV, 8SP, 8HA, 8DI, 8BP, 8HH, 8SO, 8UO, 8OM, 8AGS, 8IL, 8JF, 8QJ, 8AOU, 8HT, 8KV, 8IN, 8LX, 8ZX, 8ZY, 8PN, 8UC, 8DA, 8XE, 8ACF, 8ZR, 8ZV, 8JS, 8AAU, 8GW, 8PT, 8ZE, 8FD, 8DV, 8ZD, 8TI, 8ADV, 8AL, 8IK, 8DJ, 8AFB, 8QM, 8AAZ, 8FT, 8YR, 9LM, 9ZO, 9ZL, 9AEG, 9YI, 9LQ, 9ZJ, 9QM, 9BW, 9ADI, 9VA, 9DJ, 9ZN, 9JN, 9WZ, 9GJ, 9DF, 9YC, 9YA, 9PC, 9PD, 9YA, 9AEG, 9VC, 9UH, 9LQ, 9JQ, 9XM, 9NQ, 9YD, 9AEQ, 9ABL, 9YB.

4BP, JACKSONVILLE, FLA.—Oct. 8 to Nov. 8.

1AW, 1JZ, 2BB, 2EL, 2PG, 2RK, 2ZC, 2ZL Mod. C.W., 3AM, 3BZ, 3EZ, 3FG, 3GO, 3HG, 3HJ, 3JK, 3KM, 3OB, 3RF, 3SX, 3VV, 3ZW, 4AG, 4AI C.W., 4AL, 4BI, 4BQ, 4BY, 4CP, 4CS, 4DW, 4DX, 4EK, 4XC, 4YB, 5AO, 5CG, 5DA, 5ER, 5FV, 5VH, 5XA, 5YH, 5ZL, 5ZP, 5ZT, 5ZZ, 8AC, 8ACF, 8CB, 8DI, 8DP, 8DZ, 8ER, 8GW, 8HH, 8RQ, 8SH, 8SP, 8XK Mod. C.W. speech and music, 8ZD, 8ZL, 8ZW, 8ZY, 9AEG, 9AOJ, 9AP, 9BW, 9DW, 9GN, 9GX, 9LQ, 9VA, NSF Mod. C.W. and phone.

5ZP, NEW ORLEANS—Oct. 1st to Jan. 15.

2JU, 2RK, 2RV, 3BZ, 3CA, 3CC, 3DH, 3GO, 3YB, 3YV, 3ZE, 3ABC, 4AI, (4AG), 4AN, (4AO), 4BQ, (4BY), 4CG, 4CP, 4DW, (4EK), 4XB, (4XC), 4YB, 5AG, 5AI, (5BI), 5BM, (5BO), (5BT), (5CA), 5CD, (5CG), (5DA), 5DO, 5DW, (5EA), (5ED), (5EJ), 5EL, 5EO, 5EP, (5ER), 5EW, 5EY, (5FL), 5HB, 5HL, 5HV, 5JA, (5JD), (5JE), (5XA), (5XB), 5YE, 5YI, (5YH), 5YM, (5ZA), (5ZC), 5ZF, 5ZG, 5ZJ, (5ZK), (5ZL), 5ZN, (5ZS), 5ZT, (5ZU), 5ZV, 5ZW, (5ZX), 6IG, 6ZH, 6JT, 8AO, 8AY, 8BO, 8BP, 8DA, (8DI), 8DJ, 8DV, (8DZ), 8EC, 8ER, 8FK, (8FT), 8GL, 8HA, 8HG, 8HR, 8ID, 8IK, 8IV, 8JE, 8JF, 8JJ, 8JQ, 8JR, 8KP, 8[illegible], 8OI, 8OJ, 8ON, 8PN, 8QJ, 8QQ, 8QW, 8SP, 8TQ, 8TT, 8VJ, 8WY, 8XC, 8XK, (8ZD), (8ZE), 8ZJ, 8ZL, 8ZP, 8ZR, 8ZT, 8ZV, 8ZW, (8ZY), 8ADE, 8ADV, 8ACF, 8AFX, 8AKV, 8ANO, 8ARW, 9AE, 9AJ, 9AP, (9AT), 9AU, 9BL, 9BP, 9BR, 9BT, 9BW, 9BY, (9CA), 9CP, 9DF, 9DT, 9EA, 9EL, 9EQ, (9FU), (9GC), 9GN, 9GS, 9HA, 9HI, 9HJ, 9HM, 9HN, 9HR, 9HY, 9JK, (9JN), 9JQ, 9JT, 9KO, 9KV, 9LA, 9LF, 9LG, (9LM), 9LQ, (9LR), 9LW, (9NG), (9NQ), 9OE, (9OX), 9PV, 9QM, 9QR, 9RK, 9SS, 9UH, 9UK, 9UU, 9VS, 9WS, 9WU, 9WZ, 9XW, 9YA, 9YC, 9YI, 9YM, 9YY, (9ZB), 9ZJ, 9ZL, 9ZM, 9ZN, 9ZP, 9ZQ, 9ZW, 9ZV, 9ZZ, (9AAC), 9AAV, 9AAW, 9ABI, 9ABL, 9ABX, 9ACB, 9ACH, 9ACJ, 9ACN, (9AEG), (9AEQ), 9AEU, 9AEY, 9AEZ, 9AFX, 9AIG, 9AKC, 9AKH, 9AMV, 9ANP, 9AOJ, 9ARW, 9ASU, 9ATL, 9AUX, 9AWX.

5YE, UNIVERSITY, MISS.—Nov. 15 to Dec. 15.

2BH, 2JU, 2WB, 3AHK, 3DH, 3FG, 3GO, (4AG), 4BQ, 4BY, 5DA, 5EA, 5ED, 5ER, 5HL, 5JE, 5XA, (5XB), (5YH), 5YK, 5ZA, 5ZC, 5ZL, 5ZP, 5ZS, 5ZW, 5ZZ, 8AB, 8AEF, 8AJ, 8ANO, 8CP, 8DP, 8DZ, 8FI, 8GO, 8GW, 8HA, 8IN, 8JJ, 8KP, 8LX, 8QJ, 8RW, 8SP, 8WY, 8WZ, 8YA, 8YE, 8ZE, 8ZD, 8ZL, (8ZR), (8ZV), 8ZW, 8ZY, 9AAV, 9AAW, 9ACN, 9AEG, 9AFX, 9AHS, 9AJI, 9AKF, 9AMV, 9AN, 9AO, 9BS, 9BW, 9EQ, (9FS), 9GN, 9GX, 9HI, 9HM, 9ID, 9JN, 9JQ, 9JU, 9LE, 9LM, 9LQ, 9PE, 9UH, (9XM), 9YC, 9ZJ, 9ZL, 9ZQ, 9ZR, 9ZV, (NSF).

RADIO 5EA, BATON ROUGE, LA.
November 15 to December 15.

1IRJ, 2NJY, 3GO, 3SW, (3ZO), 4AG, 4AI, 4AN, 4BK, 4BQ, (4CP), 4GC, 4WE, 5BC, (5BI), 5BO, 5BS, 5CG, 5DA, 5ED, 5EF, 5EO, 5ER, 5GT, 5HK, (5HL), (5JE), 5KP, 5XA, (5XB), (5YE), (5YH), 5YM, 5ZA, 5ZC, 5ZF, (5ZG), 5ZK, (5ZL), (5ZN), 5ZP, (5ZS), (5ZU), 5ZV, 5ZW, (5ZZ), 8AD, 8DC, 8DI, 8DL, 8IK, 8JF, 8KI (C.W.), 8WP (C.W.), 8ZC, 8ZL, 8ZN, 8ZR, 8ZV (C.W.), 8ZY (Spk. and fone), 9AQ, 9ABI, 9AEG, 9AEQ, (9AEY), 9AFX, 9AKC, 9AMV, 9BT, 9BW, 9DE, 9EQ, 9EY, 9FU, 9FS, 9HN, 9HR, 9ID, 9JN, 9JQ, 9KQ, 9KV, 9LC, 9LF, 9LJ, 9LM, (9LQ), 9LR, 9LU, 9LW, 9MH, 9OE, 9QJ, 9SN, 9SR, 9VA, 9VC, 9WO, 9WT, 9WZ, 9XM, 9YA, 9YI, 9YY, 9ZE, 9ZL, 9ZO, 9ZQ, NSF.

6ZA, SALT LAKE CITY—Nov. and Dec.

6ZB, 7ZI, 9LR, 9HT, 9IF, (6EJ), (6AN), (6AK), (6JD), 5ZC, (6PJ), (6JM), 6JI, (6IG), 5ZJ,

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(6ZH), (6AH), (6BQ), (7CC), 6FS, 9AEG, 9OE, 6BN, 9ER, 6KL, (6EB), 6KP, 6PR, 6CT, (6JR), (6EA), 7BQ, 6OH, 6JN, (6BJ), (6DP), 6JT, 6ZE, 6ZK, 6JC, 6EN, 7ZI, 7IM, 7ZJ, 7GO, 6NH, 6PO, 6IC, 9IF.

6AE, STANFORD UNIVERSITY, CALIF.

(6AK), 6BQ, (6CT), (6CU), 6CV, 6DH, (6DP), (6EA), (6EB), 6EC, (6EJ), (6EL), 6EN, (6ER), (6FE), 6FI, 6FS, (6FT), 6GC, 6GE, 6GF, 6GN, 6HK, (6HY), 6IF, 6IC, (6IG), 6IH, (6IL), (6IY), 6JC, (6JD), (6JI), (6JM), 6JQ, (6JT), 6KA, 6KE, (6KM), 6KP, 6KS, 6HZ, 6NY, (6OH), (6OL), 6OT, (6PE), 6PQ, (6PR), 6QM, (6QR), (6SK), 6TC, 6TX, 6UM, 6UO, 6XC, 6XZ, 6ZA, 6ZB, 6ZL, 6ZM, (6AAK), (6AAT), 7AD, 7BH, (7BP), (7CC), 7CE, 7CR, (7CW), (7CU), (7DA), 7ED, (7GQ), 7GY, 7HN, 7IM, 7IN, 7KO, 7NY, (7YA), (7YS), 7ZA, (7ZB), 7ZJ.

7KX, CASPER, WYOMING—Dec. 6 to Jan. 19.

5BI, 5CG, 5DI, 5HK, 5HL, 5IP, 5JS, 5ZA, 5ZC, 5ZG, 6BJ, 6CO, 6CV, 6EJ, 6IG, 6MD, 6MK, 6RE, 6ZA, 6ZH, 6ZO, 6AFN, 7BQ, 7EX, 7FL, 7HS, 7IM, 7XD, 7ZG, 8BP, 8ZR, 9AP, 9BQ, 9BR, 9BW, 9DV, 9DE, 9BY spk. and C.W., 9EE, 9EL, 9ET 9EQ, 9EW, 9FI, 9FL, 9FT, 9FN, 9FU, 9GC, 9GN, 9HC, 9HD, 9HI, 9HO, 9HN, 9HM, 9IF, 9IV, 9JA, 9JG, 9JL, 9JN, 9JQ, 9JT, 9KK, 9KU, 9LC, 9LR, 9LW, 9MC, 9MH, 9MY, 9NS, 9OB, 9OE, 9OK, 9OP, 9OT, 9PI, 9RU, 9RY, 9SZ, 9UT, 9UQ, 9VL, 9YO, 9ZC, 9ZG, 9ZN, 9ZQ, 9AAW, 9AEQ, 9AEY, 9AFX, 9AIF, 9AIG, 9AJS, 9AKB, 9AMB, 9ANG, 9AOO, 9AOU, 9ARJ, 9ARV, 9AVC, 9AWG, 9AWX, 9AXC, 9AXR, 9BCO, NSF.

7ZG, BEAR CREEK, MONT. — Thru December.

5BI, 5HK, 5HZ, 5XB, 5XD, 5YH, 5YM, 5ZA, 5ZC, 5ZG, 5ZJ, 5ZZ, 6AE, 6ACD, 6AFD, 6BQ, 6CO, 6FE, 6GT, 6IG, 6JT, 6JE, 6MK, 6QB, 6RE, 6ZA, 6ZH, 6ZK, 6ZL, (6ZN), 6VS, 6WV (C.W., 7AMX, 7BH, 7BV, (7CC), (7EX), 7FL, 7GY, 7HS, (7IM), (7YA), 7YD, 7XB, (7XD), 7YS, 7ZB, 7ZC, 7ZJ, 7ZH, 8HA, 8HP, 8ZC, 9AO, 9AAC, 9AEG, 9AEQ, (9AEY), 9AFX, (9AGN), 9AMB, (9AIG), 9ALG, 9AOU, 9APC, 9ASF, 9ABI, 9ABX, 9AHF, 9AVZ, 9BH, 9BW, 9EE, 9EL, 9EQ, 9FZ, 9HI, 9HM, 9HT, 9IF, 9JA, 9JL, 9JN, 9JQ, 9JT, 9KM, 9LA, 9LR, 9LW, 9MH, 9NQ, 9OB, 9OE, (9PI), 9PL, 9RJ, 9SC, 9UQ, 9VF, 9WU, 9XI, 9XM, 9XT, 9YA, 9YI, 9YO, 9YY, 9ZC, 9ZL, 9ZN, 9ZQ, 9ZT, 9ZX.

HEARD AT 8FE, BUFFALO, N. Y.
November and December.

1AW, 1AEF, 1BBL, 1BM, 1CK, 1DY, 1FAQ, 1GBT, 1GY, 1HAA, 1IAP, 1JAP, 1JQ, 1KBQ, 1OA, 1OE, 1PQ, 1PZ, 1RN, 1RQ, 1RV, 1RZ, 1SZ, 1TS 1WP, 1XE, 1XF (C.W.), 1XQ, 1XJ, 1XV, 1YD, 1ZD, 2ACM, 2ADD, 2AER, 2AHL (C.W.), 2AR, 2AS, 2BB, 2BG, 2BK, 2BO, 2CS, 2DA, 2DN, 2DR, 2HN, 2HX, 2JE, 2JJ, 2JS, 2JU, 2JZ, 2KP, 2KX, 2MC (C.W.), 2OA, 2OU, 2OW, 2PL, 2QC, 2RB, 2RK, 2SH, 2SZ, 2TF, 2TS, 2WB, 2XH, 2XX (C.W.), 2XQ, 2ZC, 2ZD, 2ZL (C.W.), 2ZM, 3AA, 3ABC, 3ABD, 3ACM, 3ACS, 3AHK, 3BA, 3BG, 3BZ, 3CE, 3CS, 3DH, 3DR, 3DS, 3EN, 3EP, 3FG, 3GO, 3HG, 3HJ, 3HX, 3IW, 3JN, 3KM, 3MP, 3OM, 3OO, 3OU, 3PU, 3QF, 3SM, 3TA, 3UC, 3VV, 3XH, 3YV, 3ZA, 3ZW, NSF, WWV, 4AI (C.W. & Spk.), 4AL, 4AN, 4BQ, 4DM, 4MM, 4XB (C.W.), 4YA, 4YB, 5DA, 5XA, 5YE, 5YH, 8AB, 8ABG, 8ACF, (8ADR), 8AEE (8AMQ), (8AMZ), 8ANI, 8ANA, 8AY, 8BP, 8BY, 8CV, 8DA, 8DI, 8DR, 8DV, 8DZ, 8EC, 8EK, 8EV, 8ER, 8FC, 8FK, 8FW, 8GI, 8HA, 8HI, 8HG, 8HY, 8ID, 8IK, 8JJ, 8JU, 8JF, 8KP, 8LX, 8LQ, 8ML, 8MM, 8NI, 8WZ, 8OI, 8OM, 8PI, 8QG, 8QM, 8RQ, 8RW, 8SP, 8TT, 8UE, (8WV), 8WY, 8XE, 8XH, (8XK), 8XU, 8ZA, 8ZD, 8ZE, 8ZF, 8ZK, 8ZQ, 8ZR, 8ZW, 8ZX, 8ZY, 8ZZ, 9AAC, 9AEG, 9AJ, 9ATL, 9AU, 9BP, 9CA, 9DC, 9EE, 9EL, 9EQ, 9FG, 9FM, 9GC, 9GN, 9GP, 9GW, 9HK, 9JN, 9JT, 9KD, 9KV, 9LN, 9LO, 9LQ, 9LR, 9MK, 9MS, 9OR, 9OX, 9PN, 9UH, 9UU, 9WR, 9WZ, 9XM, 9XU, 9YI, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZV. Canadian: 3BP (C.W., 3BT, 3CA, 3CF.

8EL, BUFFALO, N. Y.—Dec. 23 to Jan. 23.

1AW, 1BB, 1BBL, 1CK, 1FQ, 1GBC, 1GBN, 1GBT, 1HP, 1HAA, 1OE, 1RAY, 1YB, 2DA, 2DR, 2EL, 2JU, 2OO, 2RB, 2RK, 2RL, 2TF, 2ZL (C.W.), 3BP (Can.), 3BQ, 3BZ, 3DA, 3DH, 3EN, 3GO, 3GX, 3HJ, 3QM, 3SH, 3TB, 3UC, 8AL, 8AHN, 8AHV, 8AOK, 8APB, 8BP, 8DP, 8DR, 8FM, 8FR, 8FW, 8GI, 8HP, 8JS, 8QM, 8RQ, 8SP, 8TB, 8XE, 8XU, 8ZA, 8ZD, 8ZY, 9FH, 9ZB, 9ZL, NSF (I.C.W. & C.W.), XB1 (C.W.), XF1 (C.W.).

8WE, ELMIRA, N. Y.—December.

1BA, 1BM, 1BBL, 1CB, 1CD, 1CK, 1CM, 1CBX, 1DY, 1FF, 1GBC, 1HAA, 1HBI, 1IAP, 1JQ, 1OE, 1PAO, 1RAY, 1RU, 1WR, 1XT, 1XV, 1XX, XF1, 7B1, 2AHK, 2AWL, 2BG, 2BQ, 2CC, 2CM, 2DA, 2FG, 2HN, 2JU, 2KM, 2OM, 2SZ, 2TF, 2TJ, 2XF, 2XQ, 2XZ, 2ZL, 2ZM, 3AC, 3ABC, 3ACS, 3AHK, 3CC, 3EP, 3FN, 3FR, 3GO, 3GX, 3HG, 3HJ, 3IW, 3JK, 3KM, 3OU, 3PU, 3QW, 3RW, 3SC, 3TJ, 3TJH, 3VV, 3YV, 3ZG, 4AI, 4DM, 4XB, 4YB, 5DA, 8AAG, 8AB, 8ABX, 8ACF, 8ADH, 8AFB, 8AGC, 8AJ, 8ANJ, 8ARW, 8BG, 8BP, 8CF, 8DP, 8DR, 8DY, 8EC, 8FT, 8GG, 8GH, 8GI, 8HA, 8HY, 8IK, 8IN, 8JJ, 8JS, 8KE, 8KP, 8KZ, 8LG, 8LH, 8MJ, 8ML, 8NI, 8OJ, 8OY, 8PT, 8QJ, 8RO, 8RQ, 8RW, 8SH, 8SP, 8TN, 8TT, 8UP, 8WY, 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8ZN, 8ZR, 8ZV, 8ZW, 8ZX, 8ZY, 8ZZ, 9AAW, 9AD, 9AWX, 9FN, 9GX, 9HR, 9JN, 9JQ, 9JT, 9LQ, 9MC, 9TH, 9UH, 9YM, 9ZL, 9ZQ.

9CA, MINONK, ILL.—December.

1AN, 1AW, (1BL), 1DY, (1JQ), 1OE, (2BK), 2DN, 2FT, 2GR, (2HN), (2JZ), (2RK), (2RV), (2SZ), 2TF, 2TS, 2UC, 2XQ, (2ZD), 2ACM, 2ARY, 3DH, (3EN), (3GO), 3HG, (3HJ), (3HX), 3IW, 3PU, 3RJ, (3VV), 3WL, 3XF, (3ZA), 3ABB, (4AG), 4DM, 4EK, (4XC), (5AG), (5AL), (5AO), 5BI, 5CA, (5CG), (5ED), 5EF, (5EJ), 5HL, (5ZP), 5ZT, 5ZU, 6HS, 6JD, 6KA, 6OT, (6WV), 8AB, 8AT, (8AY), 8BO, 8BP, (8CF), 8CG, (8CV), (8DC), 8DV, 8FD, (8FI), (8FK), (8FR), (8FT), 8FY, 8HT, 8HM, (8ID), (8IK), 8IN, 8IV, 8JF, (8JJ), (8KM), 8LB, 8LG, (8MH), 8ML, 8NZ, (8OJ), 8PN, 8QJ, 8RQ, 8RU, (8VJ), 8VQ, 8WY, 8WZ, 8XE, (8XH), 8XI, 8XK, (8ZL), 8ZR, 8ZW C.W., 8ZZ, 8AAZ, (8ADE), 8AFS, 8IFS, 8AJW, 8AKA, 8AKE, (8AKV), 8OIG, 9AD, 9AL, 9AU, 9AX, (9BW), 9BY fone, 9CP, 9CS, 9DF, (9DU), (9EE), (9EL), 9EK, (9EQ), 9FP, 9FT, 9FU, 9GC, (9GN), 9HI, 9HM, 9HN, (9HT), 9HO, 9HY, 9IF, 9IR, (9JN), 9JQ, 9KN, 9KO, (9KV), 9LC, (9LM), (9LR), 9MC, 9MH, 9MS, 9NF, (9OE), (9OX), 9PV, 9QI, 9RA, 9RG, 9RM, 9RV, (9RY), 9SV, (9TT), (9UH), 9US, (9UU), 9VL, 9VW, 9WE, 9WT, (9WU), 9XI, (9XM), 9ZB, 9ZC, 9ZJ, 9ZL, 9ZN, (9ZQ), (9ZT), 9ZV, (9AAC), 9AAF, 9AAJ, (9AAV), (9ABI), 9ABX, 9ABZ, 9ACH, 9ACJ, (9AEG), 9AEQ, 9AEU, 9AFX, 9AGY, 9AHD, 9AIK, (9AJI), (9AKC fone & spk.), 9ALI, 9ARG, 9ATL.

JOHN TERRY, COLORADO SPRINGS, COLO.
Dec. 1st to Dec. 15th.

1AW, 1HAA, 2XX (phone), 2XJ (phone), 5AT, 5XB, 5ZP, 6AAS, 7IK, 9AIF, 9RI, 9AMB, (9XE), 9AAF, 9EQ, 9LY, 9AKG, 9AEU, 9EE, 9LR, 9ZL, 9AEG, 9JE phone.

LAFAYETTE, INDIANA (9FD)—Jan. 3 to Jan. 16.

4AU, 4CG, 4CP, 4JE, 5DA, 5LA, 5YH, 8AG 8AKV, 8HJ, 8HM, 8HR, 8LD, 8LZ, 8XK, 8ZAE 8ZE, 8ZL, 8ZY, 8AAW, 9ABL, 9ADN, 9ADS, 9AEG, 9AR, 9ASI, 9ASR, 9AST, 9AWR, 9AWX, 9EQ, 9GX, 9HM, 9KR 9LF, 9LQ, 9RR, 9UK, 9VI, 9WZ, 9ZJ, NSF WWV.

9ZL, MANITOWOC, WIS.—Jan. 3d to 17th.

1ARJ, 1AW, 1NB, (2GR), 2JU, (2RK), 2RL, (2SZ), 2TF, 2XQ, 2ZM, (2AHK), 3BH, (3CC), (3DH), 3GO, 3XF, 4AN, 4XB, 5BI, 5ER, 5HL, 5IS 5JD 5XA, (5XB), (5YH), 5ZP, 7EX, 7GS, 8ADE, 8AFS, 8AHR, (8AKJ), 8ANK, (8APU), 8ARW 8CV, 8DV, 8FG, 8FK, 8FT, 8GI, 8GW, 8HA, 8HG, (8HI), 8ID, 8IK, 8JS, 8KE, 8LJ, 8ML, 8NI C.W. 8NM, 8NZ, 8OI, (8OJ), 8RQ, 8SP, 8TV, 8VJ, 8WV C.W., 8XE, (8XK), 8XU, (8ZL), 8ZR, (8ZT), (8ZV), 8ZW, (8ZY), 8ZD, 9AAC, 9ABL, 9ABX, 9ACB, 9ACL, 9AEG, 9AEQ, 9AGN, 9AHD, 9AHS, 9AIG, 9AKM, 9AMX, 9AP, 9ARG, 9AT, 9ATL, (9AWX), 9AWG, 9BR, 9BW, 9CP, 9CS, (9EE), (9EQ), 9ET, 9FU, 9GO, (9HM), 9HR, (9JL), (9JN), (9JQ), 9KK, 9KV, 9LC, 9LM, (9LQ) (9LR), 9LW, 9MH, 9MS, 9OE, 9SS, 9UK, 9UQ, 9UT, 9WE, (9WU), (9XI), 9YB, 9YC, 9YI, 9VY 9ZB, (9ZC), 9ZJ, 9ZN, (9ZQ), 9ZS, 9ZY, 9XM.

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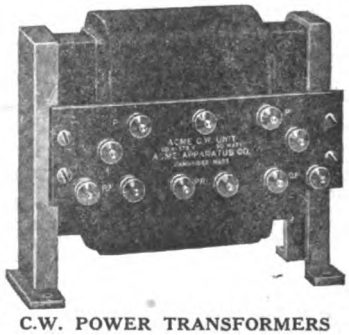
1RAY, BURLINGTON, VT.—December
1AS, 1AW, 1BL, 1BBL, 1BM, (1CK), 1CM, 1CP, 1DR, (1DY), (1EAW), (1EP), 1FN, 1FU, 1GA, 1GBC, 1GBT, (1GM), (1GY), (1HAA), 1JJ, (1JQ), 1JZ, 1MX, 1OW, 1OE, (1PAO), (1PG), 1SZ, 1TS, 1TZ, 1UE, 1XG, 1XT, (1WA), 1WE, 1XF, (2AM), 2AHK, 2AWL 2AR, 2ARA, 2BB, 2BFH, 2BK, 2BM, 2CK, 2CS, 2CT, 2DA, 2DI, 2EN, 2IF, 2HN, 2HX, 2JU, 2JZ, 2OA, 2OM, (2OO), (2OU), 2OW, 2PL, 2QC, (2MV), 2RK, 2TS, 2WL, (2XQ), (2XX), 2ZC, 2ZM, (3ABC), 3AK, 3BG, 3BH, 3CA, 3CM, 3DH, 3EH, 3EV, 3FB, 3FM, 3GO, 3HG, 3HX, 3HZ, 3KM, 3NR, 3VV, 3XF, 3YV, 4BQ, 4YB, 5DA, (8ACF), 8AFB, (8AMQ), 8AMZ, 8APU, 8ARW, 8BP, 8ED, 8EV, 8FI, 8FK, 8GI, (8HA), 8HG, 8HM, 8HN, 8HR, 8HT, 8IC, 8IK, 8IN, 8JF, 8JS, 8JT, 8JU, 8KM, 8KP, 8LO, (8LQ), 8ML, 8NI, 8NZ, (8PQ), (8QJ), 8SF, 8SH, 8SP, 8XK, (8XU), (8ZA), (8ZE), 8ZL, 8ZR, 8ZV, 8ZY, (8ZZ), 9AAW, 9AP, 9AN, 9BW, 9FM, (9FN), 9GS, (9HR), 9JN, 9JT, 9LQ, 9MH, 9UU, 9XM, 9ZJ, 9ZN, NSF.

2AIH, TUCKAHOE, N. Y.—Dec. 1 to Jan. 18.
1AS, 1AW, 1BBL, 1CK, 1CY, 1DY, 1GBC, 1GY, 1HAA, 1IBD, 1JQ, 1OE, 1RAY, 1RL, 1VAA, 1XK, 1XF, 2ACC, 2ACM, 2ACK, 2AEF, 2AER, 2AFT, 2AGA, 2AHL, 2AID, 2AIM, 2AJS, 2AKI, 2AKS, 2ALL, 2ALP, (2AM), 2AMI, 2AMQ, 2AMY, 2ANL, 2ANQ, 2ANZ, 2AOG, 2APH, 2APJ, 2AQF, 2ASH, 2AST, 2AUM, 2AVR, (2AXP), 2AYY, 2BB, 2BAF, 2BBN, 2BAI, 2BEB, 2BK, 2BG, 2BM, 2BW, 2CC, 2CK, 2CJ, 2CL, 2CT, 2DA, 2DH, (2DK), (2DN), 2FD, 2FO, 2GM, 2GR, 2HF, 2HJ, 2HN, 2HT, 2HZ, 2IF, 2JJ, 2JN, 2JP, 2JU, 2JZ, 2KQ, 2LH, 2LJ, 2MA, 2ME, 2MF, 2MP, 2NN, (2NT), 2OA, 2OC, 2OM, 2OX, 2PB, 2PE, 2QE, 2QR, 2QK, 2QY, 2RB, 2RK, 2RR, 2TF, 2UA, 2UE, 2UH, 2UI, 2VA, 2VZ, 2WG, 2WI, 2WU, 2XK (phone), 2XX (phone), 2YM, 2YY, 2ZE, 2ZD, 2ZL, 2ZM, 2ZN, 2ZR, 3ACS, 3BG, 3BH, 3DH, 3DR, 3EN, 3GE, 3HB, 3HJ, 3NY, 3OQ, 3RG, 3VA, 8ACF, 8ACU, 8AF, 8AKA, 8ALM, 8AM, 8AKJ, 8CG, 8DA, 8DC, 8DV, 8FI, 8FT, 8FZ, 8GI, 8HA, 8HP, 8HY, 8JE, 8JQ, 8JU, 8KE, 8LF, 8NI, 8NL, 8NM, 8OI, 8OM, 8QM, 8SP, 8TO, 8VJ, 8VW, 8WU, 8WY, 8XE, 8XK, 8XU, 8ZA, 8ZE, 8ZD, 8ZL, 8ZW, 9ZL, 9ZJ, 9LQ, 9ZN, 9BP, NSF, WWV.

T. C. WHITE, JR., 3EN, NORFOLK, VA.
Dec. 5th to Jan. 5th.
1AER, 1AW, 1BAB, 1BBL, 1CZ, 1EAV, 1EBW, 1GBC, (1GBT), 1HAA, 1JAP, 1OE, 1RAY, 1TF, 1TS, 2AA, (2AR), 2BB, 2BG, (2BK), (2BM), 2CM, (2CT), 2CY, 2DA, (2DI), (2DN), (2EL), 2GR, 2HG, (2HN), (2JJ), (2JU), (2JZ), (2ME), 2OM, 2PL, 2QO, 2RB, (2RK), (2RM), 2RT, 2RV, 2SU, 2SZ, (2TF), (2UC), 2UE, 2VA, 2XQ, (2ZD), 2ZL, 2ZM, 3AA, (3AAE C.W.), 3AAN, 3AAS, 3ABC, 3ACM, 3ACS, (3AHK), (3BG), (3BH), (3BZ), (3CC), (3CK), 3CL, (3CR), 3CT, (3DH), 3DS, (3EH), 3EP, 3EV, 3GX, (3HG), (3HJ), 3HW, 3HX, 3IW, 3JC, 3KM, (3OB), 3OU, 3PU, 3QW, (3UC), (3XF), 3YX, (3ZA), 3ZZ, (NSF C.W. & fone), 4AG, 4AL, 4AN, 4BK, 4BQ, (4BY), 4CJ, 4DA, 4EE, (4YB), 4XC, 5BC, (5DA), (5ER), 5FV, (5XA), 5ZL, 8AAG, (8AAV), 8ACY, (8ADE), (8AE), 8AEE, 8AEY, 8AF, 8AGZ, 8AIB, 8AJW, 8AKA, (8AKV), 8AKJ, 8AMQ, 8ARW, 8AS, 8AY, (8BO), (8BP), 8BV, 8CF, (8CP), (8CV), (8DC), 8DJ, 8DP, 8DV, 8EC, 8EV, 8FI, (8FK), 8FL, 8FM, 8FP, (8FT), 8GB, 8GW, 8HA, (8HG), 8HH, 8HM, 8HP, 8ID, 8IK, 8IL, 8IV, 8JF, 8JG, (8JJ), (8JS), 8KE, 8KM, 8KP, 8LE, (8LF), 8LQ, (8MH), 8NZ, (8OJ), 8PT, 8QJ, 8QL, 8QM, (8RQ), (8SP), 8TD, 8TN, 8TT, 8VJ, 8VK, (8WY), (8XH), 8XK, 8XU, (8ZA), (8ZD), (8ZE), 8ZG C.W., 8ZH, (8ZL), 8ZT, (8ZW spk., C.W. & fone), 8ZX, (8ZY), 8ZZ, (9AAC), 9AAF, 9AAG, 9AAW, 9AAV, (9ABI). (9ABL), (9AP), 9AV, 9AMN, 9AON, 9BP, (9BW), (9CA), 9CF, 9CP, 9DV, 9EL, 9EQ, 9ET, 9EZ 9FT, 9GC, 9GN, 9GP, 9GS, 9GW, 9HG, 9HM, 9HN, 9IIW, 9JN, 9JT, (9LM), 9LQ, 9MB, 9MC, (9MH), 9MP, 9OE, (9OX), 9PJ, 9PV,

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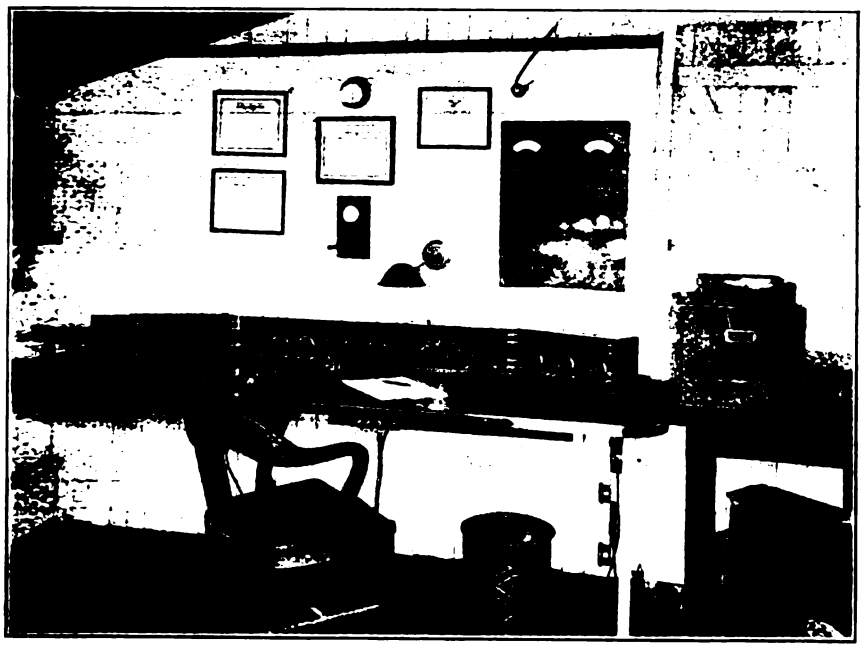
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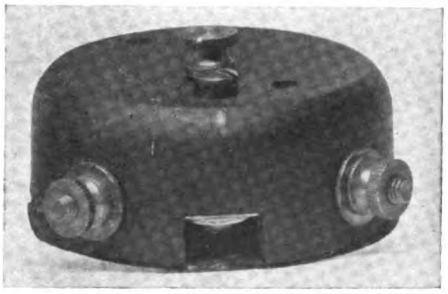
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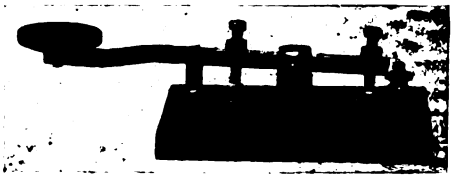
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MARCH, 1921

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.

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THE AMERICAN RADIO RELAY LEAGUE

"A national non-commercial organization of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, and for scientific growth."

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QST
A Magazine Devoted Exclusively to Amateur Radio

The Story of The Transcons.

By K. B. Warner

FELLOWS, we did it! Smashed it into bits—just naturally lambasted the everlasting stuffing out of it! "Aint it a grand an' glorious feeling?" It is! Tiddle-de-da-de-doo!, as our prize rooster Geschnell crowed when he put the final licks in.

Do you ask why all these screamers? Be it known to you, Fellow A.R.R.L. Members, that this little old organization of ours created some glorious additions to the history of Citizen Wireless in the Transcontinental Relay Tests of middle January. when we broke the previous record so badly that you'll never even find the pieces. We put one across and back in six and a half minutes! It was truly F.B. In the weeks that have since passed we have managed to make up a little of our lost sleep and are gradually coming back to earth, so that now we can take up the reports and see just how we accomplished these things that brought joy and pride to the heart of every A.R.R.L. man. So, from a vast pile of reports received at Headquarters, the story is slowly being put together. There are still places to be heard from and some blanks still exist in our story, but for the most part we now know how the messages moved and are able to present the tale in order that we may study it and take lessons therefrom for our next attempt.

The plans for the transcons were first announced in the December QST and the schedules appeared in the January number. It will be recalled that the scheme was to have relays for several nights in a row, with several messages going each night, not only so that all parts of the country might participate but because the QRM made it more realistic and would give a better test of just what we could do. During these first few nights, too, the relay machinery would be getting into smooth running and the unintentional interferers would be rounded up, so that conditions would be well lined up for a pure speed test on the final night. Our entire League seemed to enter wholeheartedly into the idea, and great interest was manifested everywhere. All the Division Managers and their helpers worked hard on the job, local organizations assisted in spreading the news and preparing local QRM-control to make operating easier, and the individual station owners were full of enthusiasm to a man, not only those who were on the routes but those whose chief duty it was to keep quiet. In addition to this splendid co-operation from the organization we were blessed with almost perfect weather over the eastern two-thirds of the country.

The results of the tests are now history, but a glorious history it is. All amateur records went to smash before our almost perfectly-working machine and indeed during these tests we broke our own records almost as fast as we could establish them. The copies of the logs sent into headquarters tell a most interesting story in every case, and the operators who listened in on these nights have a record of radio history in its making.

In all our transcontinental tests the scheme has been to put a message from one coast to the other and get back an answer—a round trip. Therefore unless a reply is actually returned to the point of origin we cannot count it a success, regardless of how quickly the message may have moved across the country one way. Nor when they become badly garbled in transit can they be counted successful, regardless of the speed. Of the messages between Portland, Me., and Portland, Ore., two completed the round trip OK, and one of them would have surpassed our long-standing record of 1 hours 20 mins. if the signature hadn't been garbled. Two of the three messages between Hartford and Los Angeles were completed, one of which established a good improvement on our

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old record. Of those between San Francisco and Boston, only one can be counted a success. Transcons 4, between Ellendale, N. D., and New Orleans, were child's play, on two nights hanging up figures of 27 and 28 minutes for the round trips. On the last night a series of messages was handled between Hartford and the west coast, and new figures of 23 mins., 13½ mins., 7¾ mins., and finally 6½ mins., were established!

We have concluded that the best way to set forth the story is to tell briefly what happened to each message. It must be borne in mind that our data are not complete, that reports from some of the stations conflict, and that there will unquestionably be little inconsistencies in the record, with credit omitted where credit is due and unintentionally placed where it does not belong. Our readers are asked to fill in the missing links or correct any errors they observe, in order that our official record may be a true one. It will be noted that in many cases the messages did not move as scheduled, and that when apparently "stuck" some unscheduled station who had copied it leaped into the breach and QSR'd without actually communicating with the station from which it had been copied. We wish to explain that in our presentation of how the messages traveled we are listing what appears to be the correct route over which they actually moved to their destination, and such records will not show all the stations to whom a message was forwarded for relay.

FIRST NIGHT—Jan. 14-15

No. 1. Figures in Eastern Standard Time. "Transcon 15 msg nr 1, Portland, Me., to The Mayor of Portland, Ore. Portland, Maine sends greetings to her big sister of the Pacific Coast.—Charles B. Clarke, Mayor." This message apparently started from Portland, Me., promptly at 1 o'clock via 1FV, moving to 1DY. 1BBL couldn't hear 1DY, so 1AW connected up 1DY and 2RK. The latter got it and passed it to 9ZN at 1:25, who gave it to both 9JN and 9WU. 9WU started it to 7ZG, but 7CC copied it direct from 9WU, QSL'd, and passed it on to 7DA in Portland at 1:35. Actually moved: 1FV-1DY-2RK-9ZN-9WU-7CC-7DA.

The reply, leaving Portland via 7DA at 1:40, read "Transcon 15 reply nr 1, Portland, Ore., to Mayor, Portland, Me. The mayor of Portland, Ore., reciprocates the kind greetings from Portland, Me., in true western spirit.—Geo. Baker." This went to 7CC, to 7ZG at 2:05, to 9WU at 2:25. 9ZN was busy, and 9WU gave it to 9ZL at 2:27. 9ZL gave it to 2SZ after failing to get 9ZN, but it got no further until 9WU repeated it to 9ZN at 2:35. 9ZN then started it to 2RK, but 1AW copied all of it direct except sig. 9ZN heard 1AW asking 2RK for the sig., and shot it again, making the transmission direct 9ZN to 1AW at 2:47. Meanwhile 1FV was QRX, and 1AW immediately started to him. Some repeats were necessary, and 1TS rendered valuable help to 1AW in copying 1FV's weak and fading signals. His QSL was received at 3 o'clock, at which time 2RK had just succeeded in getting it to 1DY too, but as 1FV was Portland itself, 1DY cancelled. Actually moved via: 7DA-7CC-7ZG-9WU-9ZN-1AW-1FV.

Elapsed time, 2 hours flat.

No. 2. Figures in Eastern Standard Time. 1AW had the following: "Transcon 15 msg nr 2, Hartford, to Managing Editor, Los Angeles Times, Los Angeles, Cal. Hartford Courant, America's oldest newspaper, sends greetings by wireless to one of greatest papers in west —Managing Editor, Courant." 2RK QSL'd this at 1:08, and 8ZW, who had copied from 1AW, gave him an immediate QSL and broke to 5YH. Meanwhile BCO had copied 1AW and QSR'd to 9LR, who in turn gave it to 6IG, and logs received seem to show that 6IG was heard calling 6JD. However, the message never got thru. In some manner 5ZA picked it up and passed it on to 6ZH about 1:30, but it does not seem to have got past 6ZH. This attempt was a failure, but the effort to get thru and back made some new members for "The Boiled Owl Club", for many of us sat up waiting for that message until the sun was up. Tracers were started out and it was learned later that it had been hours getting across the mountains. 9ZN and 9LR and 1AW stayed on the job until 1 a.m., with the air quiet and the route open as far as the Rockies, but the reply did not return.

No. 3. Pacific Standard Time. Promptly at 10 o'clock 6ZE gave 6BJ the following message: "Transcon 14 msg nr 3, San Francisco, to Boston American, Boston, Mass. Greetings good luck for 1921 from the far west paper of the Hearst chain.—San Francisco Examiner." 6BJ gave it to 6ZO, and he to 6ZM at 10:08, but the latter was never able to get rid of it because his wave, 375 meters, was higher than the bunch were listening on. 6IG came to the rescue, altho we don't know where he got his copy, and forwarded to 5ZA, thence to 9LR, and so to BCO at 10:15. Fifteen minutes from Frisco to St. Louis! BCO gave it to 8ZY at 10:19, but the eastern stations were all busy with Nr. 1 and Nr. 2, and 8ZY had to hold it—like a hot potato. 8ZL had copied it and was heard trying to give it to 2RK at 10:35, but QRM. 8ZY passed it to 8ZW, whose very-QSA signals clipped thru the jam and deposited it safely at 1AW at 10:44. 1AW called 1DY and 1CK with it, and with the valiant help of 1TS secured a

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QSL from 1DY at 2 o'clock, making one hour across. Actually moved via: 6ZE-6BJ - 6ZO - 6IG - 5ZA-9LR-BCO-8ZY-8ZW-1AW- 1DY.

1DY had difficulty in securing a reply—somebody up that way seemed to object to being disturbed at that hour of night to answer the message. It even looked at one time like the effort would have to be abandoned, but 9ZN reported both routes were open to the coast and for the love of Mfd. couldn't we get an answer? Oh Boy but it is inspiring to hear that roll in over the air: "Both routes open to coast"! 1DY decided it MUST be done, and at 1:47 started reply to 1AW, which was copied with the assistance of 1TS. This read: "Transcon 14 reply nr 3, Boston, to San Francisco Examiner, San Francisco. Your wireless greetings received. It's a long way from Mass. to the Golden Gate and good wishes for your success this year. —Boston American." 1AW popped this to 9ZN and got his QSL at 1:53, but 9LR had copied 1AW direct and immediately started to 6JT with it. It never finished, and further routing is unknown.

This attempt must be called a failure.

No. 4. Central Standard Time. 9WU gave the following to 9JN at 11:07: "Transcon 14 msg nr 4, Ellendale, N. D., to New Orleans Item. Cotton planters join National Farm Bureau.—Leader." BCO intercepted it and passed to 5YH, who gave it to 5ZP at 11:15—eight minutes. Mr. Chesser, of the "New Orleans Item", hardly knew how to reply to such a message, and in error the answer was addressed to Hartford instead of Ellendale. It read: "Transcon 14 reply nr 4, New Orleans, to A.R.R.L., Hartford, Conn. Msg recd congratulations on good work. —Chesser Item New Orleans." 5ZP gave this to 5YH, thence to BCO at 11:34, 8ZL at 11:41, thence to 2RK and from him to 1AW at 12 midnight. Being wholly unexpected, 1AW didn't know what to do with this message or what it meant, and indeed it seems most of the bunch thought it was phony and the work of some practical joker who was trying to give us a reply to Nr. 2 before it started. 1AW asked 2RK how it had come, and the redoubtable "KH" answered with a laconic Morse "C" and asked 8ZL from whence came this specimen. The lady promptly gave the full routing—5ZP-5YH-BCO-8ZL —and then it was evident that a mistake had been made and that this was indeed the reply to Nr. 4. Altho misrouted it still embodied a good performance: Ellendale to Hartford via New Orleans in 53 minutes.

Special. Eastern Standard Time. While we were all waiting for the reply to Nr. 2 to come back and for Boston to frame an answer to Nr. 3, the Traffic Manager decided to try a special from 1AW, since the routes seemed open and conditions better for getting thru than they had been for years. Accordingly, at 4:13 1AW gave 9ZN the following: "Transcon 15 Special, Hartford, to Bessey, 6ZK. Temperature thirty weather clear here this morning hows Sunnyvale.—Maxim". 9ZN QSL'd at 4:14, broke immediately to 9LR, who in turn QSL'd at 4:15—as pretty work as you could want to hear. 9LR apparently got it to 6JT at 4:20, but it did not get thru and its further history is unknown.

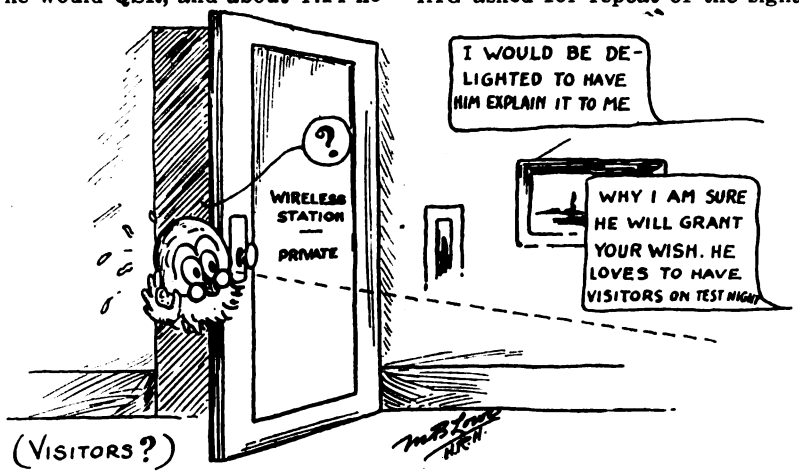
This was pretty good for the first night. In the east we were crippled by the absence of 1HAA, who had antenna trouble, but it was seen that with more stations on the job and QRM a little better under control, we could do big things. The co-operation was wonderful. 1AW maintained constant communication with 9ZN from 2 a.m. to 7a.m. with all the ease of local work and not the least bit of fading until 6:45 when the sun began to rise in Hartford and 9ZN began to weaken rapidly.

SECOND NIGHT—Jan. 15-16

No. 1. Eastern Standard Time. This message was "a regular book": "Transcon 16 msg nr 1, Portland, Me., to W. D. B. Dodson, Secretary, Chamber Commerce, Portland, Ore. Best greetings for 1921 from Portland, Me., Chamber Commerce to Chamber Commerce, Portland, Ore. Thus far we are enjoying a very open winter; very little snow; no severe cold. —E. H. McDonald, Executive Secretary." This presumably left Portland about 1 o'clock via 1FV, moving to 1CK, who gave it to 1AW at 1:45. 2RK was on too, and signified he had it OK direct by calling 9ZN, so 1AW QSL'd to 1CK and started giving him Nr. 3 for Boston while 2RK attempted to put Nr. 1 west. 9ZN gave it to 9WU, but 9WU couldn't get rid of it. No one was on west of him, and altho he broadcasted it he got no QSL. This was fortunate, however, as 2RK had lost part of it. 8ZW had copied more than that direct from 1CK, he told 2RK, and considerable chewing took place up past 2 o'clock. As 8ZW said in horror: "Nr. 1 going west with two thirds lost and 9ZN don't know the difference". "WO" must have thought it was long enough as it was. 8ZW, 8ZY, 2RK and others of the gang were running around in circles until 8ZW gave the correct copy to 8ZY at 1:56, and the latter finally succeeded in getting 9ZN's ear at 2:10, from whence it moved to 9LR, and to 6ZH at 2:36. 6ZH gave it to 6ZM but was copied direct by 6ZO, who gave it to 7DA in Portland at 2:45. The central route scores on this one, and a hard message it was, too. Actually moved: 1FV - 1CK - 8ZW -8ZY-9ZN-9LR-6ZH-6ZO-7DA.

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7DA's reply read: "Transcon 16 reply nr 1, Portland, Ore., to E. H. McDonald, Portland, Me. Greetings; enjoying no winter at all.—Van Duzen." At 2:53 7DA had this at 6ZO, whence it moved via 6ZM, 6ZH, and from there direct to 9WU in a splendid jump at 3:35, thence to 9ZN at 3:50. 9ZN started with 2RK with it, but the latter having QRM and 1TS (close to 1AW) having copied it, 1AW told 2RK to OK it to 9ZN, which was done at 3:54. 1AW then got the message from 1TS and, 2RK working east with greater ease than 1AW, gave it to 2RK at 3:57. This was a pretty late hour, and 1CK had hung up. 1ES was heard for a moment at 1AW, but ND at 2RK. At 4:09 2RK raised 1JBT, who said he would QSR, and about 4:14 he had 1JBT's QSL for it. It seems never to have gone past 1JBT, however, and 2RK finally handed it to Portland the following night. Actually moved via: 7DA-6ZO-6ZM - 6ZH-9WU-9ZN-1TS-1AW-2RK-1JBT —, but uncompleted and counted a failure.



It's ever thus on Transcon Nites.

No. 2. Eastern Standard Time. 1AW had the following: "Transcon 16 msg nr 2, Hartford, to His Honor the Mayor of Los Angeles, Cal. Mayor Newton C. Brainard of Hartford sends greetings to yourself and city by transcontinental wireless test from Conn. to Calif. Kindly acknowledge.—Hartford Courant." 1AW gave this to 2JU at 1:07, and the latter started promptly to 3DH. 3DH had QRM, but later, picking up the message, gave it to 8ZY at 1:20, whence it went to 9KV at 1:25, and from there apparently to 9LR. Meanwhile 8ZW had copied it from 2JU and gave it to 4AG at 1:17. 4AG tried to give it to 5YH, but at 1:25 the latter told 4AG it was OK at 5ZP, whether copied direct or relayed via 5YH it does not yet appear. Then began a QRM endurance contest between 5ZA, trying to get it from 5ZP, and 9LR, off schedule, trying to put it thru to some 6. Finally 5ZA got it thru a lull in the din at 1:45, passed it to 6IG at 1:49, and from there on its record is obscure, altho it got thru OK. Actually moved via: 1AW-2JU-8ZW-5YH(?)-5ZP-5ZA-6IG-???

6EN gave the reply to 5ZA about 2:20, reading: "Transcon 16 reply nr 2, Los Angeles, to Newton C. Brainard, Hartford, Conn. Hearty congratulations on the success of the transcontinental test.—M. P. Snyder, Mayor, Los Angeles." From 5ZA this went to 5YH, then to 5XA at 2:29. 5XA endeavored to give it to 4AG and the latter promptly got all of it but the signature. Then began a real battle. 4AG asked for repeat of the signature because of QRM from 2RK. 5XA obliged, but again 2RK QRM. 2RK was working on the other Transcons all this while, but the synchronism was perfect, and a dozen times in a row he unwittingly busted 4AG on the sig from 5XA. Poor old Pope; we feel sorry for his hard luck. He tried like a good man and it wasn't his fault. In fact, 5XA was repeating each letter in the signature ten times to him after the message was OK in Hartford. 4AG was heard to say in supreme disgust: "By Heck worst QRM I ever hrd in ten years u sa sig M P Snyder? Cum agn name only name only 5XA de 4AG K", and again, "Looks like luck is agnst my ever getting tt clear of QRM pse send name of mayor abt ten times and maybe cn get it btn QRM." But it was no soap, for 8ZL had copied it from 5XA and called 1AW with it at 3:05. 1AW had QRM too, but got most of it; and 8ZW came in and repeated it to him, making complete copy at 1AW at 3:13. Actually moved via: 6EN-5ZA-5YH-5XA-8ZL-8ZW-1AW.

Total elapsed time, 2 hours, 8mins.

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No. 3. Pacific Standard Time. At 9:59 6ZE gave 6ZO the following: "Transcon 15 msg nr 3, San Francisco, to Boston Globe, Boston, Mass. Wireless now links Golden Gate and Plymouth Rock; greetings.—San Francisco Chronicle." 6ZA is the man who shoved this one thru, to 5ZA, from whence it moved to 9LR about 10:10, and so to 9ZN about 10:12. From that time on until 10:30 9ZN was trying hard to dump it direct on 1AW or 2RK, but ND thru the QRM. 8ZY got it from 9ZN about 10:15 and got it as far east as 3DH, when 8ZW, who apparently had copied 9ZN, gave it to 1AW at 10:35, filling in the gaps in 1AW's copy of 9ZN's 10:30 transmission. 1AW called 1CK with it at 10:36 but 1CK advised he had copied it from 8ZW at 10:32. Actually moved via: 6ZE-6ZO-6ZA-5ZA-9LR-9ZN-8ZW-1CK.

There was another delay in getting the Boston reply started. 9ZN got impatient and wanted to know "Whats matter up there—too many beans?" But at 11:37 1CK was on the reply to 2RK, who had QRM, but 1AW QSL'd and gave 2RK the missing parts, at 11:48. The message read: "Transcon 15 reply nr 3, Boston, to San Francisco Chronicle, San Francisco. Plymouth Rock returns greetings and congratulations to the Golden Gate.—Boston Globe." 2RK then developed gap trouble and was testing for several minutes, unable to operate, but fortunately 9ZN had got a complete copy from 1AW when the latter was repeating it to 2RK, and put it right thru to 9LR at 11:55. It is not clear just where it next went, but the thread is picked up at 6ZO, whence it went to 6BJ at 12:14, and to 6ZE at 12:18. Actual routing: 1CK-1AW-9ZN-9LR-???-6ZO-6BJ-6ZE.

Total elapsed time, 2 hours, 8 mins.

No. 4. Central Standard Time. This was too easy. 9WU had the following: "Transcon 15 msg nr 4, Ellendale, N. D., to Item, New Orleans. Tardy New Year's wishes from north to south.—Leader." At 11:37 9WU gave this to 5BI, and 5BI tried to give it to 5YH, only to be informed that the latter had already QSR'd it to 5ZP. The reply read: "Transcon 15 reply nr 4, New Orleans, to Leader, Ellendale, N. D. We herewith return New Year's greetings from south to north.—New Orleans Item", and passed up via 5ZP to 5YH to BCO to 9JN, but was intercepted by 9WU when BCO transmitted it, at 12:04, making 27 minutes for the round trip.

Conditions were better this second night, and more of the messages got thru. There were fewer stations making QRM, but the night was marked in the east by the unusual activity of 3PU, who took the first prize of the anti-capacity condenser as Chief CQ-er. 1AW's log shows him "in" no less than twenty times and really he seemed never to be working anyone but simply calling and having a real good time all by himself, and on a wave the breadth of which Mr. Kolster forgot to take into consideration when designing his w.k. decremeter. The air was so quiet that he must have thought something was wrong with either his receiver or transmitter, and derned if he wasn't going to stick at it until he got things to working right. 2RK and 1AW finally asked 8ZW to "Tie up tt 3PU", and "WX" rolled out some great big QRT's, with the emphasis so much on the T's that they fairly bristled. Finally our friend got the idea, and, content with having been logged only some twenty odd times for QRM, retired and has not been heard since.

THIRD NIGHT—Jan. 16-17.

No. 1. Eastern Standard Time. Another long one: "Transcon 17 msg nr 1, Portland, Me., to Brother Ben L. Norden, Exalted Ruler, B. P. O. Elks, Portland, Ore. We of Portland, Me., lodge rejoice in perfection of a method of communication that so easily speeds this message across the continent and we extend hereby sincerest fraternal regards.—N. D. Colcord, Exalted Ruler." At 1:10 1FV started this from Portland to 1CK, but between direct copying and a few fill-ins from 1AW, 2RK got a copy before 1CK could offer to QSR, and was hard after 9ZN, who QSL'd at 1:24 and gave it to 9LR and 9WU. 9WU passed it to 7ZG, whence it went to 7CC at 1:45, and from there to 7ZI and 7DA in Portland, Ore., at 1:50. Actually moved: 1FV-2RK-9ZN-9WU-7ZG-7CC-7ZI-and 7DA.

The reply read: "Transcon 17 reply nr 1, Portland, Ore., to Exalted Ruler, Elks Lodge, Portland, Me. Message received OK Portland returns fraternal greetings. —Secretary, Portland B.P.O.E." 7DA started this at 1:55 to 7CC, who acknowledged at 1:57 and gave it to 7ZG at 2:01; thence to 9WU at 2:07, 9ZN 2:08, 2RK at 2:14, and thru to 1FV who receipted for it at 2:18:30. This would have broken our transcon record by 11½ minutes, except that somewhere west of 9ZN the signature became garbled and that part of the job had to be done over. 9LR had got it straight around 2:15, and 8ZW tried hard to get it from him but it was impossible thru the QRM. 8ZY worked 9LR and got it, but before he could QSL, 8ZL started east with it, but neither of them got there because 2RK had successfully copied 9LR direct and put thru the correction in the signature to 1FV at 2:31, which time must be counted as the ending time. Reply actually moved via: 7DA-7CC-

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7ZG-9WU-9ZN-2RK-1FV, and the corrected reply via ???-9LR-2RK-1FV.

Total elapsed time, 1 hour 21 mins., one minute longer than the record.

No. 2. Eastern Standard Time. A serious effect was made to break the record with this message, and it was held until Nr. 1 westbound was out of the way and the air somewhat quieted. It was short, reading: "Transcon 17 msg nr 2, Hartford, to Los Angeles Times, Los Angeles. How is Calif. weather.—Hartford Courant." 1AW started it at 1:26 but it got a bad start, as 9ZN was QRM-ing the whole east while working west on Nr. 1, and 2RK missed it. 3DH, however, QSL'd for it immediately, but didn't know what to do with it. Eventually he started it to 8ZW, who broke to 4AG immediately, with 2RK (who copied it from 3DH) calling 3BZ and the latter calling 4AG. There was quite a lot of confusion about this time, and steady QRM all over the east from 9ZN who was very loud this night, so that things looked pretty black for Nr. 2. 2RK simply was not to be left out of this relay, and gave the message to 4AG at 1:35. This was the transmission that actually saved the day, as 5YH copied 2RK direct, and succeeded in handing it to 5ZA at 1:55. (Up to this time we in the east were very dubious of the chances of this message, as it seemed all the careful plans had gone askew, but at 1:57 8ZL told 8ZW it was OK at 5ZA and this good bit of news was repeated by 2RK.) Two minutes later 5ZA had it at 6IG, and in two additional minutes it was safe at 6JD, 1:59. The routing via which this message was actually relayed to reach its destination is most unusual: 1AW-3DH-2RK-5YH-5ZA-6IG-6JD.

The reply was brief also: "Transcon 17 reply nr 2, Los Angeles, to Hartford Courant, Hartford. Raining in Los Angeles tonight.—Los Angeles Times." This seems to have left Los Angeles via 6EN, reaching 6IG about 2:10, 5ZA at 2:15, 5YH at 2:18. We don't know whether 5YH gave it to 8ZL or whether he gave it to 5ZP and was copied by 8ZL in so doing, but at any rate 8ZL called 2RK with it and got a GA at 2:22. 9ZN was so loud in the east at this time that they had to ask him to QRX, and after a repeat 2RK got it at 2:24, breaking immediately to 1AW, who QSL'd at 2:27. Actually moved via: 6EN-6IG-5ZA-5YH-8ZL-2RK-1AW

Total elapsed time, 1 hour and 1 minute, a new record!

No. 3. Pacific Standard Time. 6ZE started the following at 10:07: "Transcon 16 msg nr 3, San Francisco, to Boston Globe, Boston, Mass. Golden Gate accepts Plymouth Rock's greetings and returns best wishes for 1921 via the American Radio Relay League.—San Francisco Chronicle." 6ZE gave this to 6ZO at 10:09, who QSR'd it to 6ZH at 10:16, whence it went to 9LR at 10:23. The record is next picked up at 9KV and we are not sure whether or not 9KV got it direct from 9LR. He gave it to 8ZY at 10:32, who handed it on to 2RK at 10:45 after again having to wait for the eastern stations to find time to take it. "One at a time", as 2RK sed. 2RK called 1CK, and after a repeat, got 1CK's QSL at 10:54:30. Moved via: 6ZE-6ZO-6ZH-9LR-???-9KV-8ZY-2RK-1CK.

No reply to this message was ever started out of Boston, altho the routes were open and everybody along the line was yelling for it. Up to 1:10 Pacific Time 1CK was still reporting "no answer yet to nr 3." As no reply was returned, this attempt must be called a failure.

No. 4. Central Standard Time. 9WU started this to 9JN, finishing at 11:02. 9JN had difficulty in finding anyone to take it and finally dumped it on 9LR at 11:08. From there we have no record of it, nor at this writing have we the text of the message. 5ZP started the reply, however, at 11:21, reading: "Transcon 16 reply nr 4, New Orleans, to Leader, Ellendale. Yours of tonight received 25 very gud work hope this beats that time.—New Orleans Item." 5ZP got no QSL for this, but 5BI again came to the rescue and repeated it, which was copied direct by 9WU at 11:30, making 28 minutes for the round trip. From 5BI the message moved in several jumps to 9JN, who offered it to 9WU at 11:53, only to be told that 9WU had had a copy of it for the past 23 minutes.

These valley relayers proved that the United States simply isn't big enough from north to south to provide them much of a relay, and we'll have to think up something harder for them to do next year.

Special. Eastern Standard Time. Around 2:30, while everybody was waiting for the reply to Nr. 2 to start from Boston, a scheme was hatched to try another special to the coast. The routes being open and the air quiet, the temptation was too great to resist. 1AW asked 9ZN to get all set, and word was passed along the line. At 2:49 1AW transmitted: "Transcon 17 Special, Hartford, to Bessey, 6ZK. Number two breaks record. Answer.—Schnell." 9ZN QSL'd at 2:50, 9LR QSL'd at 2:52, and got it to 6ZH at 2:58. The whole east was quiet for this record, interrupted for a few minutes when 2RK gave the preceding night's Nr. 1 to 1FV, 1JBT having been unable to QSR, or when one of the gang would pipe down some local QRM. There was a golden period in this time, from 2:56 to 3:02, when absolutely dead silence prevailed in Hartford, everybody in the eastern states straining their ears

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for the reply. Meanwhile 6ZH had passed the message to 6ZO at 3:03, whence it went to 6ZE at 3:05. No reply came back, and at 3:28 9LR reported the western fellows said Bessey wasn't on, so this attempt for a record also failed.

FINAL NIGHT—Jan. 17-18.

This was the night of nights—a night foredestined to add to the laurels of our organization. The weather was not as good as on any of the three preceding transcon nights, but nevertheless pretty fair. In the eastern half of the country there were light strays, increasing as the night wore on, with "induction" trouble rather general; while west of the Rockies a bad rain storm was raging.

There is really something very theatric in the line-up for a big Transcon test. We have been interested in radio for a good many years, and we have seen a good deal of it from the amateur side, but the wonder of it never palls. There is a genuine fascination for us on any old night when we marvel of our ability to sit in a half-darkened room before a little collection of instruments, with the audions dimly glowing and hear the messages from our friends come buzzing in thru the night. How much greater the thrill, then, on this eventful night as the entire country got set for the endeavor to hang up a new speed record. Mr. Bessey had wired Headquarters during the day, requesting that the special transcon be postponed to 3 o'clock if possible, as that would be a better hour in the west. At 2 a.m. 1AW broadcasted a QST announcing that the test was postponed an hour and that several messages would be tried instead of one. 8ZW, 2RK, 8ZL and 9ZN were asked to take up and repeat this QST, and soon the news had spread to every corner of the country, being taken up and repeated in each section. Everybody was on edge for these tests, and more than one shaky fist testified to a little nervousness. Gradually the air became more quiet, with here and there a brief request to "QRX pse OM transcons", until finally not a signal was to be heard except from the leading stations who were participating in the preliminary arrangements. The great organization of the A.R.R.L. was clearing decks for action. From 3 o'clock until 4:45 not a signal was audible at 1AW when 9ZN was silent except two times when 5ZA was barely readable, yet hundreds upon hundreds of stations were QRX with eager ears, and the very air was tense.

The plan was to see that the route was open to the coast before the test started, and 9ZN was asked to line up a route and report. 9LR stood by to assist him and 9ZN connected up OK with 5ZA, who in turn was open to 6ZA and 6JD. The line-up, then, was 1AW to 9ZN to 5ZA to 6ZA to 6ZK, and so efficient were these stations known to be and so perfect the co-operation, that it was understood from the first that it would be a high-speed job, with no such thing as waiting for a QRV—the stuff was going thru and it had to be copied. 9ZN and 1AW each had two operators, one to do the tuning only and the other to copy and transmit, and it was a pretty sure thing that nothing was going to get by these stations. With the eastern part of the country silent as the grave, for probably the first time since Marconi invented spaghetti, 9ZN was buzzing along at 30 per getting his lines laid, and finally at 3:01 he turned to 1AW and reported "All set GA."

SORRY, O.M.

that this isn't the kind of story that can have illustrations. But we think you'll find it mighty interesting — it's A. R.R.L. History!

There were five two-way messages this night, and for the purposes of this story we shall call them A, B, C, D, and E. The times are the elapsed time between the beginning of transmission at 1AW and completion of QSL for the reply by 1AW, and all figures are in Eastern Standard Time.

(A)—All being in readiness, and getting a firm grip on his key, at exactly 3:06:30 Traffic Manager F. H. Schnell operating 1AW started the first message, which read: "Bessey 6ZK—Answer exact time you receive this—Maxim." 9ZN QSL'd at 3:07:30 and broke immediately to 5ZA, advising 1AW at 3:09:50 that it was OK at 5ZA. 5ZA did not QSR to 6ZA as scheduled, but instead gave it to 6JD. 6ZA copied it, but was unable to hear 6ZK because of the bad weather. 6JD passed it to 6ZK but the latter had already copied it from 5ZA. He replied to 6JD, which 5ZA copied direct. 9ZN QSL'd 5ZA at 3:29 and broke to 1AW with the following: "1AW—Msg recd 12:22 AM—6ZK." 1AW QSL'd this at 3:29:30. Note the speed of actual transmission of this and succeeding messages—many were clipped off at a speed around 30 w.p.m.

The routing for this message was 1AW-9ZN-5ZA-6JD-6ZK, and the reverse for the reply, and the elapsed time was exactly 23 minutes!

(B)—At 3:29:30, instantly following the QSL for (A), 1AW started another, reading "6ZK—Four above zero here how there—Maxim." 9ZN QSL'd at 3:30, and broke to 5ZA without QRV? 5ZA unfortunately was busy with 6JD and missed it, but 9ZN repeated two minutes later and

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5ZA passed it on to 6JD. 9LR gave it to 6ZA at 3:37, but the storm seems to have pretty well blocked off 6ZA. At 3:52 9ZN reported to 1AW that 6JD couldn't raise Bessey, but word was sent back to persist as it was felt certain 6ZK was on. A combination of stormy weather, low A batteries, bad QRM from arcs, and failure to understand that there was to be more than one attempt, however, had caused 6ZK to go off watch. The outcome would not have been different if he had stayed on, through, as 6JD reported he was unable to hear anyone in Frisco. It being evident that it was impossible to get thru to 6ZK, the Traffic Manager requested that a terminal station be located in Los Angeles if possible, so the work could go on. 1AW did not know at that time that 6JD was handling the messages. Word came back to QRX for a message from Los Angeles, which was being secured, and soon the following came bumping thru: "1AW—Weather very warm and raining all day weather conditions have changed and cant hear anyone north—6JD." This left 6JD at 4:10 and was received by 1AW at 4:13:30. The routing of this, and of all subsequent messages, was 1AW-9ZN-5ZA-6JD-5ZA-9ZN-1AW. Message (B) is considered to have failed, as the reply did not come from the addressee.

(C)—At 4:13:45, immediately upon the QSL for (B), 1AW started another: "6JD —What time did you start msg—Maxim". 9ZN QSL'd at 4:14 and broke to 5ZA with machine-like precision. 6JD was a man after our own heart and wasted no time in formalities: he answered this and following messages right out at his head and wrote it down on paper after it had started east. His reply moved in the same manner as all the others, except that 9LR had copied him direct and was also shooting to 9ZN along with 5ZA, and at 4:20 9ZN broke to 1AW with the following: "1AW —Started ur msg at 1:10 AM—6JD." 1AW's QSL was sent at 4:20:15.

And so was established a new transcon record of SIX AND ONE-HALF MINUTES.

(D)—At 4:20:30 1AW gave 9ZN another one: "6JD—How does Calif regard prohibition—Maxim." This message went thru like the others, except that 5ZA's QSL was relayed to 9ZN by 9LR. It reached 6JD at 4:29 and he started his reply 15 seconds later: "Mr. Maxim—Calif is supposed to be dry but it is very wet here now it has been raining all day—V M Bitz". 6JD thereby proves that he has a sense of humor as well as a sweetly-working station. 1AW QSL'd 9ZN for this at 4:34. Total elapsed time, 13½ minutes.

(E)—At 4:35:15 1AW started the final one, reading "6JD—This makes radio history what think OM—Maxim". 9ZN was right after 5ZA with it at 4:36, and it reached 6JD at 4:39:45. The boy was right there and broke out a reply which must bring loud huzzahs from the westerners: "Mr Maxim—Yes it will let the east know that there are a few amateurs in the west—6JD." It was a surprisingly short time before 9ZN was shooting this to 1AW, and the latter's QSL was sent at 4:43, making 7¾ minutes for across and back.

The Traffic Manager then sent a QST from 1AW announcing the records and thanking the gang for their co-operation, the air at once burst into activity as hundreds of stations picked up and repeated the news and talked it over, and the Trancons were a thing of the past, but their memory will remain green for many a day, till it is eclipsed when we break these records even as we did the original one.

Naturally we are very jubilant over these results, the more so as they prove our contention that with real co-operation among ourselves our outfit can do anything. The performance of the A.R.R.L. in these tests is a thing of which every one of us can well be proud—it has never before been equalled in history, and it is going to be a mighty hard job to improve upon it. Perfect co-operation made it possible. In Chicago on that last night there was not one single little case of QRM, and only the perfect co-ordination of the Chicago Executive Council could have made that possible. It is a lesson to all of us. There was QRM aplenty on the other test nights, and we could publish a big list of the offenders. However, in most cases it was unintentional, but the too-frequent CQ-ers and the ivory domes thru which the dope could not percolate were shown up pretty well. Co-operation in canning QRM was shown as much as in other operating. Those operators who so willingly stood by and kept their transmitters silent are entitled to feel that they did just as much in making these tests a success as the stations who did the actual relaying—the triumph belongs to the organization.

The average speed of transmission in the messages of the last night was quite high, and often the replies would be coming back before one could believe it possible. If 1AW hadn't written out all his messages before the tests started and had them all ready to transmit, it might have been a different story. As it was it kept a fellow busy logging the times. Listen-

(Concluded on page 47)

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High-Frequency Stuff

By "Breck"

Scientists will tell you that the mental condition necessary to result in a story like this is attained only by by eating molasses in one's soup or by monkeying with C.W. The last-named cause applies in this case—the writer is with the Precision Equipment Co., Cincinnati.—Editor.

IT was a scorching mid-afternoon some weeks ago in that majestic city of hills above which rise in towering silence the masts and antennae of the now widely known dispatcher of etherial jazz, 8XB. The writer had been laboring without success during the long hot hours trying to persuade "Millie Ammeter" to respect her contract with the "Plate Circuit Performers" which she had suddenly and unceremoniously jumped, leaving the entire show stranded. Getting peeved over her inexplicable and unladylike conduct in refusing to dance the "shimmy" at the behest of "Mr. Modulator", that most persuasive young gentleman who had been her dancing partner for so long, I decided to interview her again in the morning and let it go at that.

Before calling it a day however, I decided to attune my ears to some of the passing wave trains. I cut in a receiving unit and after the usual preliminary juggling was surprised to hear an amateur on the ether with a CW transmitter sending "canned music". After listening a bit to a piece entitled "A Short Talk on Married Life", a piece which he seemed to favor very much, but which "life" I cannot see with a microscope, I became very much peeved and was going to quit the whole shebang and streak it for P.G's for a Christmas Sundae when all of a sudden I heard a terrific agonized roar come hurtling out of the air. Horrified and wondering at the same time what human being had the energy to emit such a bellow on a day as hot as that one was, I listened in carefully and was soon enlightened. The roar had originated at the station of the amateur who had been transmitting the music previously heard and for a moment I thought that he had gotten across the "500 jolts" of his plate current but such was not the case. Oh my no! Nothing so trifling! He was merely calling the world to inform them of the High Cost of Vacuum Tubes! Sort of a "call of the wild" as it were, inasmuch as he was in a rather wild state of mind at the time! He had burned out "annuder" tube. Of course I agreed with him that it was sure hard luck, but as I make the money to buy my daily bread through the sale of vacuum tubes, I secretly congratulated myself just as soon as I was sure that he wasn't looking, over the fact that I would be able to sell him another the next day. Waiting to assure myself that he had not fainted from the shock, I shut down for the day and started for my home.

While trying to effect resonance and closer coupling between my absotively empty stomach and a juicy steak which awaited me at home via one of the tortuous routes of local travel, I began to think about the high cost of vacuum tubes and the possibilities of a reduction in the price of same through the development of some simpler and less expensive form of



"I congratulated myself that I would be able to sell him nother tube the next day."

apparatus for "exhausting" them, when suddenly and without warning, I was jarred out of my reverie by the sudden, jolting, stop of the street car which hooked me in series—parallel with a half-dozen other passengers, by piling us all in a heap up in the front end. Disentangling myself from the mass of arms and legs and getting my wits together, I looked out of a window to ascertain the cause of the sudden stop and found that one of those fast disappearing noble beasts of burden, a horse, had fallen across the car tracks and lay, an inert mass, a victim of heat prostration.

While gazing on the poor victim which was moved off the tracks very shortly to permit of the car's passage, I was imbued with a most brilliant idea! An idea with possibilities so vast that their magnitude staggered me—one so brilliant that it

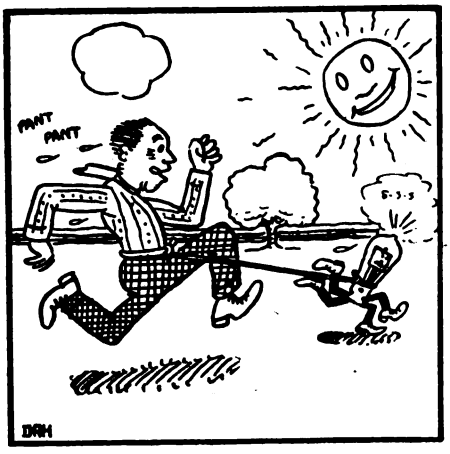
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brought back memories of the star shells of Fritz rearing their way up, up, over the inky blackness of "No Man's Land" where they burst in a dazzling blaze of light. Yes, what is more important, an idea which would mean "jack" in the pockets of the bug and incidentally my own should it prove practical.

That evening after having converted the juicy steak previously mentioned, to ions, I spent a busy two hours at my desk working out details of the idea and then turned in tired but satisfied that the idea in question would work out O.K. in practical form and further that if so, it would mean **cheap, efficient** practical vacuum tubes for every bug and a collapse of the present day uncalled-for high prices prevailing.

After my usual morning shower and a hearty breakfast I streaked it for the Lab. at 8XB "toot sweet sans stoppe" and arriving took a small leather case from one of the shelves and packed therein a knife, some stout twine, a thermos bottle which I had filled with 5% grape juice at the corner drug store, and six standard vacuum tubes from which the tips had previously been broken, thus allowing the air to enter. My preparations completed I boarded a street car and hied me to the outskirts of the town to find a suitable location in which to try out the experiment I had in mind.

After about an hour's ride and a short walk from the end of the car line, I came to a large open field surrounded by a high



"We were traveling around the field at terrific speed."

barbed wire fence which I decided would answer my purpose very well. Managing to negotiate the fence without damage to my trousers I walked to the center of the field, took off my coat, rolled up my sleeves and then proceeded to put my idea to the test. It was a very beautiful day and the sun was by this time blazing down with a white-hot blast which seemed to cause every living thing exposed to it to wither under the glare of its merciless heat waves.

I was by this time trembling with anticipation, for was I not to put to the test the greatest idea that had ever dawned on a radio bug since the invention of the vacuum tube? The sun was by this time beginning to have effect on me, for, coupled with my intense eagerness, the heat seemed absolutely unbearable. This was, however, exactly the kind of day I most desired to attempt the experiment I had in mind.

Opening the case, I removed the half dozen tubes from which I had previously broken the tips and laid them carefully on the ground in the full glare of the white-hot sun. Now, having reached this stage, perhaps it will be well to acquaint the reader with some of the details of my plan.

The previous evening when I had gazed on that poor horrse lying across the street car tracks in an absolutely "exhausted" condition, I conceived the idea as to why in the world wouldn't it be simple to employ the same method for "exhausting" vacuum tubes, instead of resorting to the expensive and complicated procedure at present employed by the large manufacturing concerns!—that is, take a herd of vacuum tubes and simply drive them in the white-hot sun without mercy until they were exhausted! There seemed to be no reason as to why the idea shouldn't work out, and, as to obtaining the various degrees of exhaustion necessary for the different types of tubes used, why, that was the easiest part of the problem. For instance, if it was necessary to drive a tube a mile to procure the proper degree of exhaustion which would be best adaptable for use as a detector, then to procure a tube for use as an amplifier, it would only be necessary to drive it about three times as far, or a total of three miles; and in the case of exhausting transmitter tubes, the procedure would be to drive them to the limit of their endurance! Now having let the reader in on my idea, we will return to the field that I had selected as the best available location to put it to the test.

I had, as before mentioned, selected a field surrounded with a barbed wire fence and had taken the six tubes out of the case and laid them on the ground. Gazing thoughtfully upon them I came to the conclusion that it would be better to try out the experiment on one tube first, so I placed all but one back in the case. Now, it is well known that nothing except vehicles, water, one's nose or other liquidified things, can "run" without legs and

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cover distance. I was therefore fortunate in that the vacuum tubes as are at the present time used in radio are provided with four legs, commonly termed prongs or terminals. The tube I selected I had carefully laid on the ground in the full glare of the sun and I had particularly taken care to stand it upright on the four legs. This operation completed, I began to take notice of the fact that I felt rather thirsty and I turned to the little case and took therefrom the small thermos bottle full of cold grape juice to refresh myself I had just placed the bottle to my lips and had started to imbibe some of the delicious liquid when I was scared out of a year's growth by an agonized shriek from behind me. Shaking, I dropped the thermos bottle and spun around just in time to see the tube I had placed on the ground going across the field on a dead gallop and gaing speed every second. I started after it but soon saw that I could never in the world hope to overtake it, so I dropped panting to the ground and watched it until it disappeared in the distance.

Thanking my lucky stars that I had not taken all six of the tubes selected for the experiment from the case, I rose and made my way back to the thermos bottle, hoping against luck that there would be some of the liquid refreshment therein, for I was by this time quite thirsty, and coupled with my sprint in the hot sun after the runaway tube, I was pretty nearly all in.

Arriving, I found that there was still enough grape juice in the bottle to quench my thirst and after resting up a bit in the shade of a large tree on the edge of the field, I decided to try my luck again, resolved, however, that I would not allow the tube to have its own way as to the direction and speed to be employed. The fact that the tube had started off on its own initiative, however, clarified my mind on one subject that had been giving me some concern, i.e., whether or not it would be possible to succeed in driving the tubes at all. It being self-evident, however, that the tube had started off on its speed run without other persuasion than the terrific heat of the now noonday sun, I banished this worry from my mind.

Taking the case which I had brought with me to the shady spot, I again proceeded to the center of the field. Taking out one of the tubes, I proceeded to fasten to it a piece of small but strong twine to hold it in check while running, for I could never hope to even reach the high speed shown by the first tube, let alone maintain it for the length of time required for the process of exhaustion. I figured that my weight tagging along on the end of the line would be sufficient to dampen its ardor for any very high speed, and further believed that it would tend to shorten the time required, inasmuch as it would tire out the tube more quickly.

This operation completed, I carefully took the tube out of the shelter of the meagre shade cast by my body wherein I had held it to circumvent preliminary exhaustion, and placed it on its four legs on



"The usual mark of esteem—a radio mast of imposing height."

the ground, after which I fastened the other end of the line mentioned around my waist. For a time nothing happened, and then watching the tube carefully, I noticed that it had commenced to sway. The movement was barely perceptible, however, and fully five minutes more elapsed before I noticed any further change taking place. At the end of this time I was startled to note that two eyes had commenced to form on the plate of the tube. Slightly later, complete features had become visible and I noted that the eyes in particular were horrifying. They were a deep green in color and a stream of multicolored ions were shooting out in all directions from them. The mouth, which appeared hard and cruel, had begun to twitch perceptibly, and soon a very faint moaning made itself heard. By this time the eyes, which had been rolling aimlessly in various directions, had centered their attention upon me, and along with the shower of ions that were emitted in my general direction, you can believe me when I say that it took all the will power I had to keep from cutting the line and beating it back to town. The sun was by this time beginning to have a slight effect on me and I began to wonder how much longer it would be before the tube started to move, when all of a sudden, it let out the same hair-raising shriek the first one had and made a terrific leap towards yours truly! Scared? I'll say so! But not too scared to make a flying leap to one side to avoid the seemingly certain collision. The tube kept right on with an

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awful jerk on the line around my waist, I was forced to follow, and I could not help but marvel at the tremendous strength which it had suddenly acquired, for I couldn't have stopped if I had wanted to and my only hope now was to keep my feet and follow, trusting that the tube would tire before I would. Fortunately, it kept to the field on the inside of the barbed wire fence, for had it decided to take off cross country as had its predecessor, I would no doubt have been billed for a through ticket to Mars or some other distant point in the boundless ether before I recovered from the effects of re-radiation due to extremely close coupling with the said wire fence. We were by this time traveling around the field at a terrific speed and I judge that that first terrible lap was covered in something less than nothing. The air was pouring from the unsealed tip with a terrific shrieking sound and I felt sure that the tube would soon feel the effects of this withdrawal and become "exhausted" ere long. After we had gone around that never-to-be forgotten field some unknown number of times I had a good square look at the features I had previously noticed on the plate and I was gratified to note that a look of intense agony had become apparent, due, not doubt, to the terrific physical exertion put forth by the tube in its mad desire to get out of the heat of the merciless sun, and further, to lack of air, which was still being drawn out of the tube by reason of the high speed it was maintaining.

Being only human, I myself was by this time getting pretty well worn out and my head seemed to be on fire with the awful heat. I full well realized that if the tube did not slacken up or drop before long, I would be forced to sever the line and give it freedom as I could not hope to keep up the pace set for any great additional length of time. I decided therefore that I would endeavor to make six more laps, and to cut the line at the end of that time if the tube showed no signs of slackening speed. W had completed four of the six additional laps which I had decided upon as being the maximum number I would be able to endure, when suddenly without warning the tube changed its course and headed slam bang for the barbed wire fence! Realizing that I was due for disaster if I did not succeed in changing its direction, I yanked and sawed on the line in earnest endeavor to do so. However, my effort was of no avail for I might just as well have tried to check the earth's momentum for all the good it accomplished. This method being of no avail, I came to the conclusion that it was time for me to cast off the line and proceed on another course under my own power, and I reached in my pocket for my knife to cut the line, which every moment was pulling me toward the fence and inevitable disaster.

But I was horrified to discover that the knife was not in my pocket and then it dawned upon me that I had left it with the case when I had cut off the piece of line now in use. Knowing now that my only hope lay in my succeeding in unbending the bowline around my waist, I attempted this, but glancing up I saw that even though I did succeed in accomplishing this I would be too late, for the fence loomed up scarcely ten feet distant and the tube was still going full tilt directly for it. I noted during this instant that a large number of rocks were stacked up just outside the fence at the point for which we were headed and it was at this time that the inevitable collision occurred. The tube, being very small, easily succeeded in passing beneath the lowest wire of the fence and kept onward in its mad rush while I was brought up with terrific force against same. The shock, as one can imagine, was terrific and just as I struck it, I was jarred and rocked and then lifted completely off my feet by an awful explosion! I was barely conscious enough to note the cause of the latter. The tube had evidently not noticed the rock pile and had crashed headlong into it. This collision, coupled with the high degree of suffocation reached in the mad race around the field during which a large quantity of air had been forcibly withdrawn from it, had so weakened it that, upon striking the rock pile, it had fallen exhausted, and the features previously noted on the plate appeared dull and absolutely lifeless, and further, the emission of ionic streams from the lurid green eyes had ceased. I full well realized in this last moment of semi-consciousness that the idea I had conceived was practical and it was at this instant the explosion mentioned above took place, caused no doubt by the intense atmospheric pressure exerted upon the tube, which in its highly exhausted condition it was unable to withstand. At the moment of explosion, I was hurled outward and upward away from the fence, and I lost consciousness for what must have been a period of several seconds, for I came to my senses high above the field and I realized that I was falling rapidly towards the earth and what seemed unavoidable certain death. Down and down I hurtled and the thought now uppermost in my mind was, "Oh, why did I ever think of putting a cheaper vacuum tube on the market for the amateur when I had such powerful and absolutely heartless forces to contend with." Why didn't I realize that I could not hope to control these

(Concluded on page 28)

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6JD and Its Operator

"YES, it will let the east know that there are a few amateurs in the west."

So quoth Mr. Vernice M. Bitz, 6JD, Los Angeles, in one of the never-to-be-forgotten Transcons, in reply to Mr. Maxim's inquiry as to whether or not they weren't clipping it off about then with considerable hot dog, etc.

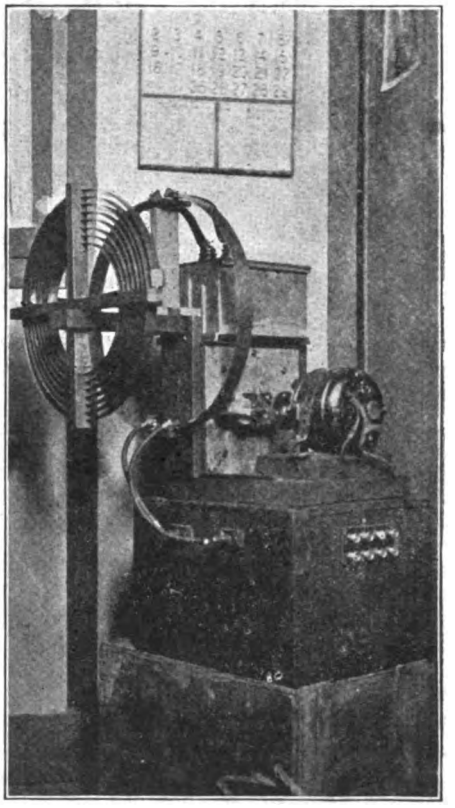
Permanent fame in A.R.R.L. affairs is Bitz's, largely because he was right on the job. Not that he didn't have the station and the ability, as he has been heard a number of times in the central states and Mrs. 8ZL was reporting him "vy QSA" during the Transcons, but when a storm on the Pacific Slope made it impossible to get the messages thru to Division Manager Bessey as scheduled and the Traffic Manager sent out word to find somebody in Los Angeles to receive the messages and answer them, Bitz was there and he goes down into history as one end of a transcontinental chain which holds a world's record.



Vernice M. Bitz, 6JD

He was born in Trenton, Missouri, Oct. 19, 1892, went to school there, and while quite young developed a keen interest in electricity. At fifteen he was experimenting in wireless and built his first apparatus. Moving to California shortly afterwards, he first took up telephone engineering, then motion picture electrical work, and since 1916 he has been an auto electrician. He resumed his radio experimenting in 1913, and had call letters 6UD before the war.

The present 6JD, shown in our photographs, is an interesting station. Except

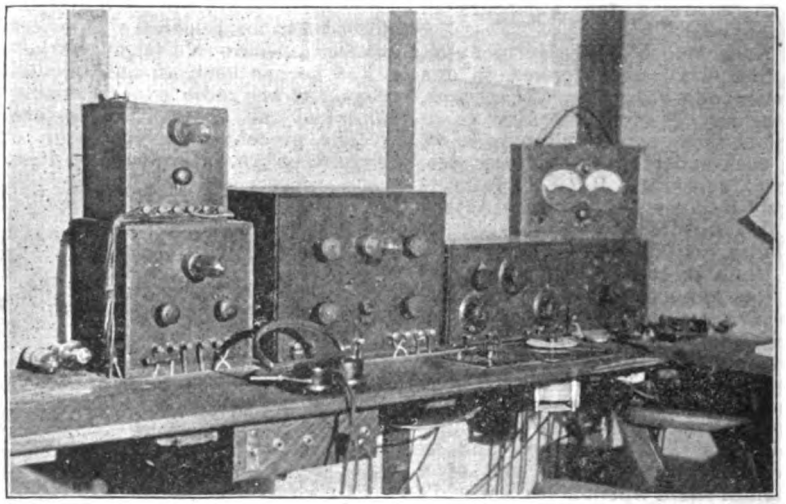


for the Dubilier condenser it is entirely home-made. The receiving set is composed of a short wave regenerative tuner, detector control cabinet, two steps of amplification, and Baldwin phones. The aerial is a T of 7 wires, 60 ft. high, 78 ft. flat-top, with the transmitter located under the center, while the ground system is composed of water pipes underground running the full length of the aerial. The antenna current, on a thermo-ammeter, is 6 amperes.

The transmitter is unusual. The arrangement is about as compact as it could be, and it certainly looks efficient. The home-made transformer is of the closed-

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core non-resonant type, with the secondary wound over the primary on both legs of the core, secondary voltage 15,000, power input 1064 watts. The gap has a 6-inch six cooling flanges, with a small fan on the motor shaft near each one to keep cool air circulating thru the flanges. The condenser has a capacity of 0.013 mfd., which



disc running 3450 r.p.m. in ball bearings, direct connected to an induction motor, and has 16 points arrranged in the so-called "spark-thru" method. It is complete housed in a casing made of two plates of ¼ in. aluminum for the ends, and an 8-inch brass drum held in grooves cut in the faces of the plates. The stationary electrodes, one on each side, are set in fibre bushings with ⅛ in. mica tubing over the electrodes, and each has gives a wave of 220 meters using one turn in the primary of the oscillation transformer. Right here a novel feature is introduced: the single large primary turn is cut at both top and bottom, and the condenser inserted at the top and the gap at the bottom. In this way much of the ordinary wasted inductance in long leads is made to serve to transfer energy.

Of course there are amateurs in the west.

The Power Tubes Arrive

SEVERAL months ago we said in these columns that beyond question power tubes shortly would be available for amateur use. Altho they have been longer in appearing than was then expected, we are glad now to announce the first of the series, the Radio Corporation of America's 5-watt UV-202, with other models soon to follow.

Within a few hours after the permission to release this tube on the amateur market we were favored with a visit from our old friend Mr. H. C. Gawler, former radio inspector and now handling the amateur distribution of R.C.A. tubes, who brought one along to show us and gave us the particulars on its characteristics.

As shown in the illustration, the new tube is a somewhat larger version of the UV-200 and 201, being 2⅛" overall diameter and standing 5" high including the base. The general shape and disposition of the elements is practically identical with that of the smaller tubes, the filament being an inverted V of tungsten. It is rated at five watts but is a big husky tube for that power and is good for 10 watts in continuous service, altho the life will be lessened by so pushing it. In fact, as much as 20 watts is possible from it, but is not recommended at all.

The normal plate voltage is 350, with 400 volts the recommended maximum. The life at 400 volts is 250 hours and up, a great improvement over previous tubes of this same general type and output. The filament current is 2.35 amperes plus or minus 6%, at 7.5 volts, being designed to operate from an 8-volt storage battery. The amplification constant is 7 to 9, and the output impedance 4000 to 6000 ohms at 350 volts. The price is $8.00.

The base plugs into the standard receiving tube socket. The R.C.A., in-

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cidentally, is bringing out a porcelain socket for these tubes, to sell at $1.00.

This tube looks mighty good to us and



we certainly rejoice to see our greatest C.W. problem diminishing by its appearance. While we have not tested the tube, we trust the General Electric Co. enough to know that it must be a good job.

Mr. Gawler also gave us some interesting data one the other styles of power bulbs which will soon be ready for distribution. The 50-watt U tube has been redesigned to increase its life to a satisfactory figure, and is promised for distribution in middle March under the type number UV-203 at a price of $30.00 each. The P tube, the big G.E. pliotron rated at 250 watts, will likewise be put on the amateur market about April 1st at a price of about $110. It will be known as the UV-204 and will have a life of 1000-1500 hours. Much research work has been done to secure this life, the Navy P tubes made under war-time stress having averaged around 70 hours. A full kilowatt tube, of metal, nick-named "the iron tube", is also promised by the fall at a price around two hundred dollars. These larger sizes will find very limited use in amateur affairs, but the UV's 202 and 203 will be "our meat".

Incidentally the Radio Corporation is bringing out several sets of its own in which to use these tubes—probably a D.C. set, a set using kenatrons on A.C., and a self-rectifying A.C. set. These will be purchasable in separate units so that one may buy just what is needed and nothing more, and if all goes well they will be on the market by summer.

Now how about that C.W. set?

Some Experimental Regenerative Tuners

By McMurdo Silver

THE present trend of two-hundred-meter receiver design seems to be along the lines of greater ease and simplicity of adjustment for the different circuits, with the aim of using as few variable elements as possible. In most cases this is accomplished by reducing the wave length range, thereby doing away with inductance switches to a great extent. This method is highly commendable, but is not all that can be done with an idea of obtaining greater efficiency.

Within certain limits, the simpler the receiver the more efficient it is; and the fewer controls the greater the ease of finding an unknown transmitter, and the simpler the final tuning. But as the number of adjustments is decreased, so is the selectivity in most cases, and especially is this the case when improper fixed antenna coupling is used with an oscillating or regenerative receiver.

Below are brief descriptions of three types of short wave receivers utilizing the simplest oscillating circuits at present known, the first two having only three critical adjustments for each, and employing nothing more than the tuned plate circuits, in the first inductively tuned and in the second by means of shunt condensers. The third has a tickler coil to produce regeneration. All three are suitable for spark, CW or 'phone reception, and the wave length range will approximate 150 to 400 meters, depending upon the antenna used and slight variations in construction.

In Fig. 1 is shown a fixed-coupler variometer-tuned circuit, using only one tube, as do the others. The antenna inductance consists of thirty turns of No. 22 DCC magnet wire wound on a three-and-one-half inch tube, with a ten turn coupling coil wound in between the twentieth and

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twenty-first turns. This winding then has the appearance of one coil of forty turns, as the antenna coil is stopped at the twentieth turn and jumped over for a space to the twenty-first so that the grid coupling coil may be introduced on the

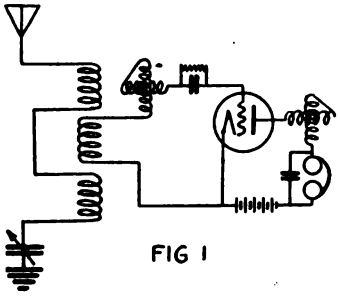


FIG 1

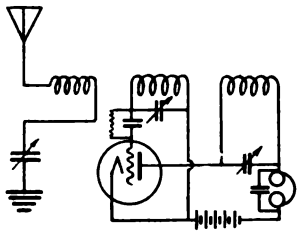


FIG 2

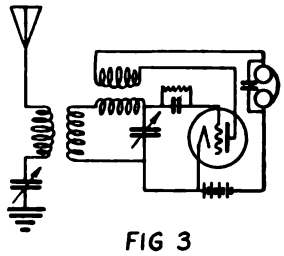


FIG 3

same tube. The antenna circuit is tuned by a series condenser of 500 to 1000 mmf., the grid and plate circuits being tuned by two variometers of the Radio-Craft or Radisco type.

In the second set, the circuit of which is given in Fig. 2, condensers are used to tune all three circuits, and, like the first, uses fixed antenna coupling. In this case all three inductances are wound on one form, this being a three-inch tube. The antenna and grid coils consist of 35 turns each, of 20-38 Litz, with a spacing of 1.75″ between their adjacent edges. The plate coil, wound .90″ away from the grid coil consists of 25 turns of the same wire. The antenna circuit is tuned by a 500 mmf. series condenser, and the grid and plate

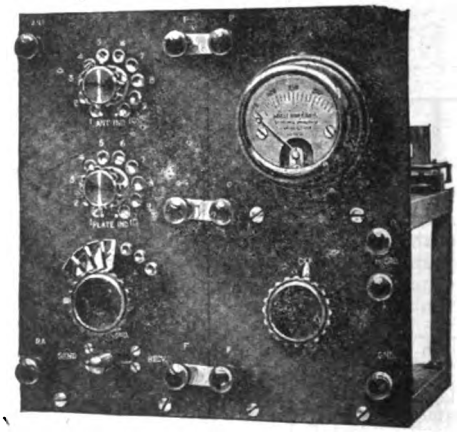
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New Apparatus

A REMARKABLE radiophone, known as Type OT-3 "Midget", has been placed on the market by the DeForest Radio Tel. & Tel. Co. As shown in the cut, this set is mounted on a panel only 9″ x 9″, with the controls and apparatus of a typical DeForest radiophone, and with the additional advantage that tuning is done by means of tap switches.

The "Midget" radiophone is designed to work on any source of direct or alternating current supplying up to 500 volts and employs three standard transmitting tubes of the several types now on the market. It is made up in two panel sections, each being 4½ x 9″ in size. On the panel at the left is mounted the aerial oscillating circuit with all necessary controls. In addition a send-receive transfer key-switch is mounted near the base of the panel. The antenna and plate taps on the helix in the rear of the panel are controlled by the ten point switches shown on the face of the panel and the grid tap is controlled by a similar switch not shown.

Below the tap switches is mounted a fan type condenser switch permitting step by step variations in the series aerial condenser. This condenser is mounted in the rear, together with a plate choke coil and binding posts for both the A & B power supply. The binding posts for the antenna and connections to the receiver, together with three posts for connection to the tube unit on the right, are mounted on the face of the panel.



On the front of the tube panel is mounted a 0-1 amp. scale hot-wire ammeter and the control knob for the filament rheostat, which is mounted in the rear. Binding posts are provided for connection to the microphone and ground. In the rear are mounted grid stopping and filament

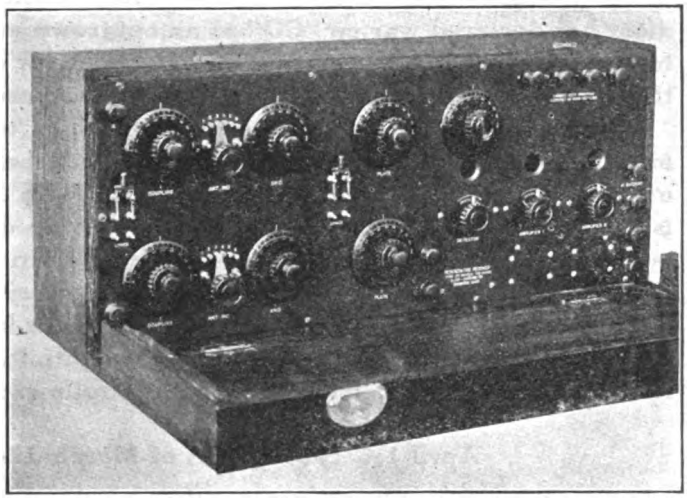
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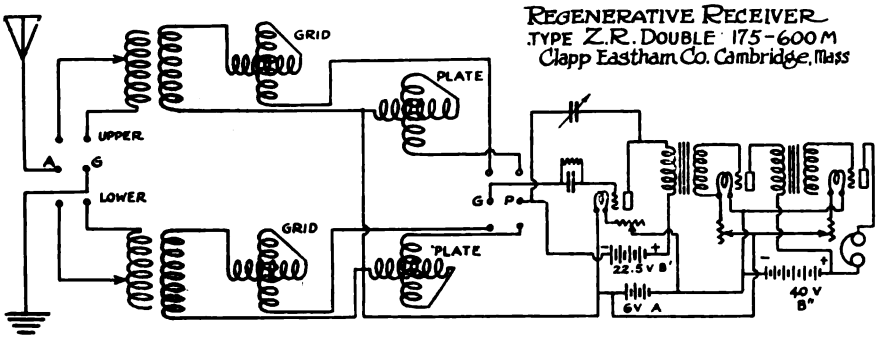
insulating condensers and the grid leak. Receptacles for three tubes are provided, and a standard type modulation transformer completes the equipment. Links connect the two panels.

With a source of 500 volts potential at least ½ an ampere may be put into the average amateur antenna on a wavelength of 200 to 600 meters. With 100 volts "B" battery as power supply .1 to .2 of an ampere may be obtained. But one 6 volt storage battery is required, since the current for the microphone is obtained by taking a drop off the filament circuit of the tubes.

The "Midget" radiophone on laboratory test indicates that there would be no difficulty in obtaining a range of 30 miles consistently and indications are that under actual amateur service conditions, this range may be increased to several hundred miles.

As the two sections of the Midget radiophone are sold separately, the experimenter may buy either and construct the other in any way he may see fit. With the antenna circuit panel as a basis, it will be but a simple matter for the average amateur to complete the set by means of standard equipment in the nature of receptacles, condensers, etc., which he may already possess.





A new receiving equipment known as type ZRFD, has recently been put on the market by the Clapp-Eastham Company, Cambridge. The fundamentals upon which it is based are more or less familiar, as every one in the radio fraternity knows and has probably used the highly efficient tuned plate and grid circuit of Major Armstrong.

The new Clapp-Eastham set comprises two complete units for tuning, with change-over switches on the front of the panel. Thus the wave length may be changed from one of two values to the other without either the loss of a moment's time or laborious tuning. A detector tube control and two stages of low frequency amplification are mounted on the panel. A variable condenser is connected across the plate of the detector tube to the negative terminal of its B battery, which materially aids in close adjustment on weak signals.

The set measures 26¾"x11½"x10⅝", the bakelite panel being set in a polished oak cabinet of ⅞" stock, with hinged cover, two locks, and a substantial handle. This, altogether, makes a compact portable receiving equipment of efficient design. The wave length range of this set is from 175 meters to 625 meters.

TRANSATLANTIC TESTS FAIL

Word has just arrived from Mr. Philip R. Coursey, London: "No signals received from States." As yet we have no details.

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A.R.R.L. "CQ" Party, April 1st.

"CQ". What does it mean to you when you hear it? To most of us it means that some bird is causing unnecessary QRM. The A.R.R.L. Operating Department has declared war on "CQ" as an outgrown antique. We are going to have our last chance to get it off our hooks for ever and all time, and this CQ Party has been arranged for this purpose.

Everyone is invited to take part and open up on high power and any old speed and call "CQ" as per schedule below—and get CQ out of his system for all time. Set your watch with NAA, as the schedule is for Eastern Standard Time. Do not overlap on your time as everyone must QRX and see how many stations he can log from each district as they take their turn calling "CQ". Remember it does not make any difference whether you operate a squeak-box, a high-powered spark, a CW set, or a radiophone, this is your chance to take part in the biggest A.R.R.L. party ever held. The schedule follows:

April 1st, 1921 (night of March 31st.)

12:00-12:03 a.m.	All Canadian amateurs call "CQ" (using intermediate "fm" between "CQ" and their sign).
12:03-12:06	All 1st District stations call.
12:06-12:09	" 2d "
12:09-12:12	" 3d "
12:12-12:15	" 4th "
12:15-12:18	" 5th "
12:18-12:21	" 6th "
12:21-12:24	" 7th "
12:24-12:27	" 8th "
12:27-12:30	" 9th "
12:30-12:33	All stations, all districts.

Maybe Mars will hear us.

This will be quite a relief from the strenuousness of relays and fading tests, and we point out that April Fool's Day is a particularly appropriate date for anything connected with "CQ". Anyone calling "CQ" after April 1st rates a "Hi", and deserves the key with the rubber contacts.

If you don't take part in our party it will be your fault, not ours.

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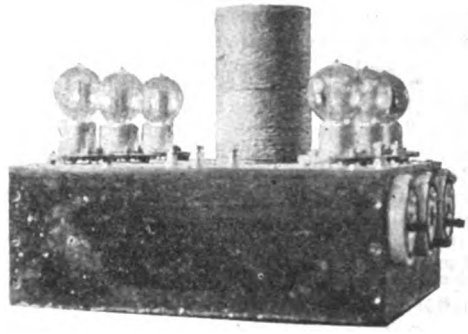
A Description of 4XB, Savannah

IN our issue for November last Mr. Arthur J. Funk, Science Assistant at the Senior High School, Savannah, Ga., gave us a description of station 4XB, of which he is in charge, under the title "Some More C.W. Ideas". Important changes have been made in their equipment since then, and 4XB has held its own as one of our best C.W. stations. Mr. Funk has now favored us with complete details of the station, which our C.W. enthusiasts will find most helpful. The schematic hook-up is shown in the circuit diagram, and the photograph shows the appearance of the set-box.

4XB's aerial is an 8-wire cage 60 ft. long, elevated 30 ft. above the roof by steel masts situated on a 60 ft. building. The roof is of tin, and is used as the ground. No other grounds are used, Mr. Funk particularly pointing out that multiple grounds are highly unsatisfactory in C.W. work. The lead-in consists of four wires bound together and held away from the building by bridges.

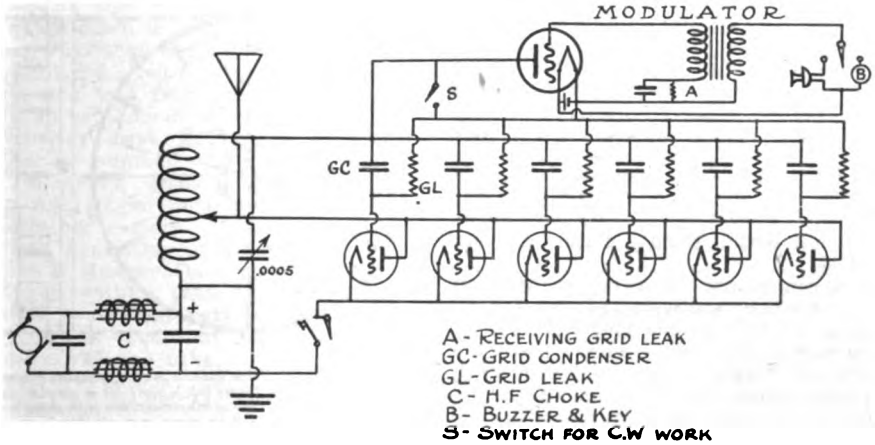
The high voltage for the plates is obtained from an old 500 volt D.C. motor driven at 2000 r.p.m. and delivering about 480 volts. The filter consists of a choke in each generator leg made of 500 turns of No. 26 D.C.C. wire on a bundle of wire nails 3 in. long and 1 in. thick, with a total capacity shunted across the generator of 6 mfds.

pure lampblack and plugging both ends with brass plugs. The measured resistance of such a leak is about 7800 ohms. The inductance consists of 80 turns of ordinary 7/22 antenna wire on a pasteboard tube 5 in. in diameter, impregnated with paraffin, the turns separated by paraffined cord. Fifteen of the 80 turns are used in



the plate circuit, and across the extremities of the inductance a variable condenser of .0005 mfds. maximum capacity is shunted. This condenser is absolutely essential to the working of the circuit.

The plate supply is interrupted by the key for straight C.W. but for I.C.W. and telephony a new system of modulation, devised by Mr. Funk, is used, amounting



The circuit resolves itself into a kind of a modified Hartley affair. Six VT-2's are used in parallel as oscillators. Each has its individual grid condenser, consisting of three copper plates 3 in. x 3 in. separated by thin mica. Each condenser has a grid leak, made by filling a glass tube 4 in. long and $\frac{3}{4}$ in. diameter with

in effect to an amplified-grid-leak control. In the grid leak circuit of the oscillators a modulator tube is inserted so that the leakage of the oscillators passes from its filament to its plate. It is obvious that the leakage may be completely controlled by the impressed potentials on the grid of the leakage tube, and these potentials

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may be either voice or buzzer telegraph, obtained from an ordinary (Acme) modulation transformer whose primary is excited by a microphone or buzzer. The secondary of this transformer is connected to the grid and filament thru a small condenser, which is also leaked by a small receiving leak to prevent lagging on the grid. A negative bias of course is necessary on this grid, which is obtained thru the leak by getting the proper polarity on the battery which excites the primary circuit. This battery also heats the modulator filament. The entire modulator arrangement with all its accessories must be carefully insulated.

After months of experimenting and continual improvement, the antenna current of 4XB has reached 4.4 amperes on 380 meters C.W. with an input of slightly over 100 watts. We do not know the antenna resistance. The signals have been heard in almost every state east of the Rockies, and the phone has been reported from Lansing, Mich. They are able to work 2ZL, XB1 and XF1 on C.W. when QRM and QRN are heavy and audibility very poor.

Mr. Funk wishes thru QST to thank the amateurs who have kindly reported 4XB's signals, and adds that he will take pleasure in giving A.R.R.L. members any information possible regarding C.W. work.

Break-In Operation

By D. W. Richardson, 3DH

THE system to be described has been in use at 3DH all fall and works perfectly. Any station audible can break-in any time and be heard. It saves endless QRM, for as soon as the receiving station gets the msg OK, a simple "R" tells the sending station to go on; and if there is QRM at the receiving station, a simple ". — . . ." tells the sending station and you will be convinced of its practicability.

In using a phone set, it permits two-way conversation, provided the station to be received is not within twenty meters of your sending set.

The arrangement is very simple. It means a separate one-wire antenna for receiving, a one-half or one megohm grid resistance across the grid condenser so that the bulb will "come back" quickly, a small needle gap across the terminals of the receiving set to keep the energy absorbed by the receiving antenna from sparking in the receiving set; and, most important of all, the A.C. leads around the table enclosed in conduit or suitably shielded so that there will be no hum in the receiver while the rotary is running. (If your station is remotely controlled, this last caution is not necessary.)

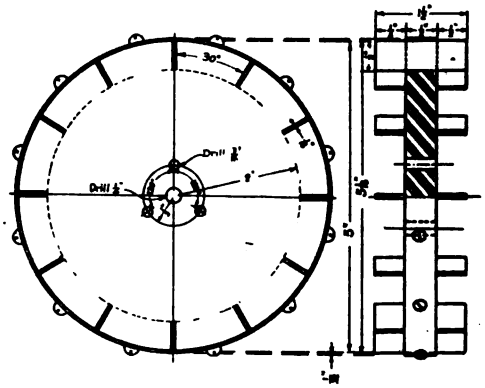
In regard to the receiving aerial, as stated in QST use only one wire and make it long. Don't be afraid to put it on one of your poles, as the energy absorbed from the sending set is so small that there will be no appreciable decrease in your strength. However, keep it as far away as possible.

If You Can't Afford A High-Priced Rotary—

By Wm. E. K. Middleton, Canadian 4AQ

IT is very pleasant to go into an amateur radio station nowadays, especially if it is the station of a millionaire, and to gaze upon an array of beautiful Bakelite panels and about half a dozen tubes, and to be shown a transmitter of the very latest type, which probably cost a thousand or two, and which puts into the antenna an unheard-of number of amperes of continuous oscillations. Now you may visit my station if you think you would be enlightened, but I warn you that the apparatus is for the most part home-made for want of ready cash.

In short, I had to have a rotary, but the necessary evil was not forthcoming. With the aid of an enthusiastic father, a rotary was constructed—but that was before I knew anything about rotaries, and the old thing has since had to be scrapped. This is the second attempt, a few years later. I do not think I need to say anything about constructional details, for I think



that the drawing is self-explanatory. But the design has one or two advantages that are worth mentioning.

(1) This gap possesses a combination of the good points of the "straight-through" gap, with those of the thin, wide electrode.

(2) The only serious expense is the Bakelite disk—and if you still owe your

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last month's board-bill, a wood disk might do at a pinch.

I might say that this gap was constructed for a one-half KW set, but the design could very well be adapted to larger powers.

Amrad Activity

IN order to help reduce QRM by the more extensive use of quenched gaps and low power, the American Radio and Research Corporation is offering free during the month of March, one Amrad ¼ K.W. Quenched Gap with every Induction Coil. This offer is particularly directed to relay men and is intended to give tangible proof of the performance of this combination in actual use.

A schedule of broadcasts has been arranged for every Wednesday and Saturday during the duration of the special offer. Most of the stations listed below will use both the quenched gap and induction coil. In addition, some of the stations will employ an Amrad Coil for I.C.W.

The purpose of the schedule of broadcasts is simply to show the radio fraternity what the Amrad Quenched Gap and Coil will do and let the members judge for themselves the results obtained.

The stations which will send out the QST messages every Wednesday and Saturday during March follow:

	E.S.T.
1XE	4:30 p.m.
1GY	9:00 p.m.
1OJ	9:10 p.m.
1AK	9:20 p.m.
1FW	9:30 p.m.
2CX	9:40 p.m.
2PL	9:50 p.m.
3EM	8:50 p.m.
8AIW	9:10 p.m.
	C.S.T.
8ZZ	9:15 p.m.
5XG	9:30 p.m.
8HG	9:45 p.m.
9ZH	9:50 p.m.
	P.S.T.
6HI	9:30 p.m.

The Log of An Amateur at Sea

A WELL-KNOWN Brooklyn amateur who is now at sea as a commercial operator but who remains a dyed-in-the-wool ham, read our request in QST that commercial operators off duty chase down to 200 once in a while and tell us what they hear, and the following document is his log of amateurs during a three-months' trip from New York, thru the Canal, up to Vancouver. Beyond doubt it will convey first knowledge of new records to a number of A.R.R.L. men. Stations in every district were copied, and none was logged until its call letters were absolutely certain. The equipment was a crime, consisting of a junk "tuner" made from a Quaker Oats box, no taps, and equipped with a tickler. One stage amplification was used part of the time, but most of the reception here recorded was done on but one tube.

For various reasons the name of the operator and his vessel are not published here, but we will give the author's address to any amateur listed who may wish to communicate with him.

Dec. 12, 120 miles south New York City. NAA time. Slight QRN.

7:27 p.m. 2OO calling 8JO QRK
30 1RZ calling 3UC QSA QSS
31 8JO calling 1RZ QTC? QRZ
32 1HAF PRB pse
35 3PU calling 8DV
36 8DV calling 3PU
37 2UE QRK
38 2BB QSA
43 3QW calling CQ QSA
44 2EL calling 2AJW very QSA
45 1AE calling 3PU
47 2JU "Tester pse QRT"
8:35 8SP calling 2BB very QSA
40 1OW calling 1DT QRK
50 8ZA calling 5XA QRK
55 8ZD calling 5KD

140 miles south New York City.

10:20 p.m. 2JU calling 3VV very QSA
24 1JQ calling 1AE very QSA
25 3BH very QSA
27 8ZP do.
28 8SP do.
30 2OM do.
40 1TS do.
42 1OW do.

Dec. 13, 380 miles south New York City. NAA time. QRN rather heavy.

5:30 p.m. 2HN QSA
6:44 3BZ calling 3YV QSA
47 3FG calling 3BZ QSA
7:52 5DA calling 4YB QSA
53 4YB calling 5DA very QSA
9:06 3EN calling 5DA QSA
10:25 8SP calling 9GN QSA
26 3ABC calling 4YB QSA
30 3FG QSA

400 miles south New York City, 500 miles off shore. 3VV, 5DA, 4YB, 3BZ, 3EN heard all evening QSA.

Dec. 14, 600 miles south, 300 miles off shore. NAA time. Heavy QRN.

8:50 p.m. 3EN sending QST very QSA
55 5DA calling 3EN very QSA
9:00 2HN calling 1HAA QSA
11:20 3BZ calling 3AA QSA
25 8ZE calling 3EN
55 1JAP calling QRK

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12:00 2EL calling CQ very QSA
02 2JJ QSA
12 2BB QSA very
21 1BM calling 3VV QSA very
3VV very QSA and steady past 3 hours.
2JJ QSA and steady as at Brooklyn.

Dec. 15, 900 miles south, 300 miles off Key West, QRN medium.

6:10 p.m. 2HN QSA
31 2JU calling 2RK very QSA
33 8SP working DX QSA
57 2ZM QSA
7:12 1BM QSA
14 2DA QRK
15 3AHK calling 2DA, very QSA
20 1RZ QSA
35 KQG and 2XJ4 steady and QSA on phone.

20 miles north of San Salvador

8:46 p.m. 2RM?
55 3EN calling 2RM QSA
9:15 NSF calling 8ZN very QSA
45 2HN QRK
11:17 2JU very QSA and steady.
48 8XK calling 2XX, very very QSA on buzzer, generator hum audible
52 NSF on fone QSA calling 3AAE
55 Many 8's and 9's but QRN very bad.

Dec. 16, off Cape Maysi, Cuba, heavy QRN. NAA time.

6:25 p.m. 2ARY QRK
30 3VV very QSA
31 2ARY very QSA
35 8TT calling CQ QSA
55 3VV QSA like local
2JU the same
57 8FG QSA
7:01 "Percy Smith now living in.."
09 2DN signing off to 2JU
13 2JU audible foot from fones
16 Many 8's, 3's and 2's going but cant read thru ORN

Dec. 17, 500 miles north of NAX, Colon, using 1 step amplification

7:15 p.m. Static very bad. No amateurs heard.
9:00 Several amateurs going but can't read.
20 3EP calling CQ. 500 cycle note, QSA.

Dec. 18, 200 miles north of Colon.

6:20 p.m. Static very bad. Hear a 25 cycle rotary.
7:00 No use. Static 15 feet from fones.
9:11 3EP calling 8BP QSA
17 8ZR QRK. QRN decreasing
23 8ZR calling 3EP QRK
50 9AW signing off QSA
10:38 9HR signing off QSA
39 8ZZ calling 9LQ
40 9HR again QSA
45 Hear two amateurs using straight gaps
47 5BI calling 8ZD QSA on straight gap!
11:22 9AWG calling 9EQ
23 8XK on buzzer
24 9AWG calling CQ very QSA
37 2ZM calling NV very QSA no QSS
40 5HL signing off QSA
45 QRN almost nil now
50 A whole mob of 8's and 9's going, but some yap sendng PX on 300!

Dec. 19, anchored in Colon, Panama. NAA time.

6:30 Hear some amateur but ND thru QRN
9:59 2EL calling 1HAA QRK (msg)
10:00 Several 8's—QRN very bad
08 2EL again, audible 6 inches from fones.
15 2EL a foot from fones now but QRN terrible
16 Heard a Grebe gap, almost certain it was 1HAA. very QRZ
17 9JN calling CQ QSA
24 3EN calling 2JU QRK
25 9AEG signing off
26 2EL calling 1HAA
35 5BI using straight gap QRK
39 8DR calling 3GO QRK
44 5HL QSA
46 9JN calling 9FG
47 4XB QSA 500 cycle note
51 5BI calling 9JQ QSA
54 8ZY calling 9JN QSA
56 9EQ calling CQ
57 9OE signing off QRK
11:01 8EC signing off QRK
05 9UU calling 9EQ QRK

Dec. 20, 50 miles south Balboa. NAA time.

8:15 p.m. Heard somebody calling a 9. QRN very heavy
20 Hear at least six amateurs, but QRN. It is preventing the making of a lot of records
10:00 Static worse; impossible to read anything

Dec. 21, 300 miles northwest Balboa, off Central America.

Not an amateur heard all evening. QRN still raising hob. (Later: High voltage batteries were dead and didn't know it.)

Dec. 22, 560 miles northwest Balboa, 100 miles off short. NAA time.

6:45 p.m. Several amateurs, and still broad day light. But QRN bad.
7:00 Hear several hams now but QRN. Still daylight.
25 UC working US QSA very (QRA?)
9:30 2EL very QSA, audible 2 feet from phones, but QRN breaks him up. No QSS at all.
35 2EL audible with phones on table.
37 2EL again. Louder than I get him in Brooklyn.
45 9BW? Uncertain, QRN so bad. Low rotary.
10:20 Lots of amateurs going but none loud enough to read thru QRN, which is audible all over room. Darn Shame, I calls it!

Dec. 23, 850 miles northwest Balboa, 120 miles off Champerico, Guatemala.

7:05 p.m. 5JA calling some 5. Daylight. QRN medium
12 5CA asking 5ZS QTC QRK
15 5ZX calling 5EO QSA
16 5CA calling 5EO "Glad to hear u agn OM"
20 5EO calling CQ Audible with fones on table
10:07 9JQ signing off QRK
20 8ZY calling 9ZN QSA FB
30 9EE calling CQ very QSA. Peculiar up and down note
38 9EE calling 8LQ "GA" Audible 2 feet from fones.
37 5HL signing off very QSA
39 9XM calling 9XL very QSA
40 5FL talking to 5HL very QSA slight QSS "WL QRN nw so write card OM merri xmas to u es urs"
46 9XM saying "QSY 400 nw"
50 9EE again with that phoney swinging note.
52 9ZC QSA
53 9JN very QSA. Talking about sig of some msg.
11:37 8ZV calling 9HM very QSA
41 9KV talking to 9HG very QSA
44 5EJ talking to 5AO QSA
45 5AO calling 5EJ very QSA
47 5AO on msg to 5EJ "to Miss Fannie Daniel Health Office Capitol Bldg Assn. Xmas greetings" etc. Audible 4 feet from fones.
55 5FL talking to 5JA very QSA
12:04 a.m. 5JA talking to 5FL very QSA
12:05 1BM talking to 2GM very QSA, audible 1 foot from fones. "QSS QSS QRM bad OM QRU nil nw"
13 5ZA calling with double-speed key. QRK
15 9KV talking to 5YH. QSA
17 9ZQ signing off
20 1BM calling 1TS. Audible 6 nches from fones.

Dec. 29. 350 miles south Los Angeles, Calif. NAA time.

(Continued on page 28.)

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January Station Reports

THIS is the new department of our QST announced on page 18 of the January issue. If you don't remember the article, read it again so you will appreciate the value of this section. We hope that it will be a guide to us as to just where we can work and how well, thereby enlarging upon the knowledge gained thru "Calls Heard" alone. This department should be an accurate table of who is loudest and who most consistent in every section of the country. The reports at present are confined to members of the Operating Department personnel.

The scheme is for each reporting station to list the best, second and third best stations from each district, both as regards consistency (steadiness, reliability) and as regards relative strength of signals. In the groups of three calls hereinafter, the first one is the best, the second next best, and the last one third best. Where no stations are listed from certain districts, none were heard.

1KAY, Portland, Me.

Steadiest	Loudest
1HAA—1AW—1BBL	1KAY—1HAA—1AW
2TF—2BB—2OA	2RK—2TF—2KY
3GO—3KM—3HJ	3PU—3DH—3VV
4DM	4DM
8HP—8ZD—8WY	8XK—8HP—8ZW
9UH—9FN—9LQ	9ZJ—9GN—9FN

1TS, Bristol, Conn.

1HAA—1XX—1YB or 1GY
2RK—2JU—2ZL (c.w.) or 2TF
3DH—3HJ—3VV
4XB (c.w.)—4BY
8ZV (c.w.)—8ZR—8XU or 8ZW
9ZJ—9XM (c.w.)—9ZB

3BZ, Danville, Va.

Steadiest	Loudest
1HAA—1BBL—1DY	1HAA—1BBL—1AW
2RK—2BB—2HN	2RK—2BB—2HN
3GO—3EN—3VV	3VV—3GO—3EN
4YB—4BY—4DM	4YB—4BQ—4DM
5DA—5ER—5YH	5DA—5ER—5YH
8ZL—8ZD—8SP	8SP—8ZL—8ZD
9LQ—9KV—9GX	9LQ—9HR—9GX

3EN, Norfolk, Va.

Steadiest	Loudest
None consistent	1AW—1HAA—1BBL
2RK—2JU—2SZ	2RK—2JU—2TF
3DH—3HJ—3ZA	3DH—3HJ—3ZA
4BY—4YB—4AL	4AL—4YB—4BY
5DA—5XA—5YH	5YH—5DA—5XA
8ZW—8ER—8ZY	8ZW—8ER—8ZY
9ZJ—9ZL—9ZN	9ZJ—9ZL—9ZN

4AM, DeLand, Fla.

Steadiest	Loudest
2RK—2JU	2RK
3BZ—3GO	3VV
4BK—4BY—4AG	4AN—4BI
5XA—5ZA—5DA	5XA—5DA
8ZY—8ACF	8ZY
9ZJ—9GX—9UH	9ZJ

4YA, Atlanta, Ga.

Steadiest	Loudest
1BBL—1AW	1BBL—1AW
2RK—2EL—2JU	2RK—2DA
3VV—3GO—3AHK	3VV—3GO—3EN
4AG—4BY—4AN	4AG—4BY—4AN
5ER—5ZP—5YH	5ER—5XA—5DA
8ZW—8ZL—8ZY	8ZW—8SP—8ZY
9ZJ—9LR—9AEG	9ZJ—9LR—BCO

5ZP, New Orleans

Steadiest	Loudest
2RK—2JU—2RV	2RK—2JU—2RV
3GO—3BZ—3CC	3GO—3BZ—3ABC
4CG—4AG—4AN	4AN—4AI—4AG
5BI—5ZU—5ZA	5YH—5ZX—5ZU
6IG—6ZH—6JT	6IG—6ZH—6JT
8ZL—8ZY—8ZW	8ZY—8ZL—8ZW
9AEG—9JN—9LR	9AEG—9JN—9LR

5XA, Auburn, Ala.

Steadiest	Loudest
1AW	1AW
2RK—2ZL—2ZC	2RK—2ZL—2ZC
3GO—3VV—3EN	3GO—3VV—3EN
4BY—4YB—4AG	4BY—4YB—4AG
5ZP—5YH—5ZC	5ZP—5YH—5ZC
6JD—6EA	6EA—6JD
8ZL—8SP—8DI	8ZL—8SP—8XK
9LR—9KV—9AEG	9LR—9UU—9CA

7CC, Moscow, Idaho.

Steadiest	Loudest
6BJ—6BQ—6EJ	6BJ—6BQ—6EJ
9WU—9EE—9AFX	9WU—9EE—9JN

7ZJ, Vancouver, Wash.

Steadiest	Loudest
5ZA—5XB	5ZA—5XB
6EJ—6JD—6AK	6BJ—6ZK—6JD
7CC—7DA	7CC—7IM—7AD
9EE	9AE—9AIG—9WU

8ZY, Defiance, Ohio

Steadiest	Loudest
1AW—1HAA—1BBL	1AW—1BBL—1HAA
2RK—2TF—2ZM	2RK—2ZM—2TF
3DH	3DH—3XF—3HJ
None consistent	4AG—4YB—4XC
5YH—5ZP—5BI	5YH—5ZP—5HL
8SP—8WY—8ZW	8ZW—8XE—8ACF
9LR—9AEG—9JN	9ZJ—9ZL—9LR

8ZV, Canton, Ohio

Steadiest	Loudest
1AW—1HAA—1BBL	1AW—1BBL—1HAA
2ZL—2RK—2ZM	2ZM—2RK—2ZL
3DH—3EN—3VV	3DH—3EN—3VV
4XB—4AG—4AN	4XB—4AG—4AN
5YB—5DA—5YE	5YB—5DA—5YE
8ZA—8ZR—8GW	8ZA—8ZR—8GW
9XI—9ZN—9ZJ	9ZL—9ZJ—9XM

9ZT, Minneapolis, Minn.

Steadiest	Loudest
1AW—1HAA	1AW—1HAA
2RK—2ZL	2RK—2ZL
3DH—3BZ—3XF	3DH—3XF—3BZ
4YB—4DM	4YB—4DM
5YH—5ZC—5ZL	5YH—5ZL—5ZC
6WV—6ZH	6WV—6ZH
7IM—7ZG—7CC	7IM—7ZG—7CC
8ZL—8ZY—8ZB	8ZL—8ZY—8ZB
9ZJ—9LR—9ZN	9JN—9ZJ—9YI

9YB, Lafayette, Ind.

Steadiest	Loudest
None consistent	2RK—2JU
3DH	3DH—3HJ—3EN
4YB—4AI	4YB—4AI—4BD
5YH—5DA—5ER	5DA—5ER—5YH
8ZL—8ZR—8FT	8ZL—8ZR—8FT
9ZJ—9ZL—9LQ	9ZJ—9ZL—9LQ

Can. 2BF, Montreal, Que.

Steadiest	Loudest
1AW—1HAA—1GBT	1AW—1AS—1BBL
2RK—2JU—2ZM	2RK—2ZM—2SZ
3DH—3HJ—3VV	3DH—3HJ—3HG
8ZL—8XE—8WY	8XE—8ZR—8HP
9ZJ—9ZN	9ZJ—9ZN

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The Log of an Amateur at Sea.

(Continued from Page 26.)

Dec. 24, 1100 miles northwest Balboa, 200 miles off Mexico. NAA time.

7:30 p.m. 5EO sending QST QSA
40 9AEG signing off QRK
58 5JI QRK
8:00 5ZX sending time and QST very very QSA
02 5JE calling 5ZS very QSA
05 5JE calling 5ZS audible all over room
30 5CH calling 5ER very QSA
40 2ZM signing off QSA
45 8ZY signing off—QRK very
48 5ZT calling CQ QSA
49 5XB signing off very QSA
57 8ZY signing off QSA
59 5ZC signing off QSA
11:20 8ZY talking to some 3, think 3KM, QRK
22 5BI very QRK
24 9AEG talkink to 5HL, very QSA
30 8ZE calling come 8, QRZ
31 9OE calling CQ QRK
35 BCO signing off to 4AG QSA
41 9HI calling 9OE QSA
43 5JA QSA

Dec. 25, off Tequepa Bay, Mexico (Pacific Coast). NAA time.

7:30 p.m. 5ZF calling 5ZC very strong
45 5TD calling CQ very strong
56 5JE calling 5DQ "Wanted to wish you a Merry Xmas" Strong
8:15 5ZN calling CQ very strong
30 Heavy static from storm—now impos- copy anything.

Dec. 26, 50 miles north Pt. Telmo, Mexico.

7:44 p.m. 5BI signing off to 5FA, very strong using rotary
8:00 9AEG calling 5YH QSA
11 5JX talking to 5BI
15 Heavy static—no more tonight

Dec. 27, 60 miles south Cape San Lucas, Lower California.

8:08 p.m. 5ZC calling QST with weather report, very QSA
15 Just heard a 2 station but QRN busted him.
20 5ZX just finished QST, very QSA and no QSS
24 5BI calling 5ZF QSA
26 Hear a 2 station—sounds very much like 2EY.
57 5BI calling 5ZC very QSA
9:12 6AAK signing off QSA (First 6)
14 6IG calling 9LR very QSA, audible all over room.
10:57 5ZA calling 6IF very QSA

Dec. 28, off Magdalena Bay, Lower Calif. NAA time.

8:00 p.m. 5BI signing off QSA
10:30 5ZA calling 5AC very QSA
31 6ABP QRK
11:00 5ZJ very QSA
12:25 a.m. 6ZN very QSA
56 6ER very QSA
1:06 5ZC very QSA all evening

(Concluded on page 64.)

High Frequency Stuff

(Concluded from Page 16)

forces with their unlimited resources of power! A comforting thought now entered my mind as the earth seemed to move rapidly toward me and that was the fact that if my remains were discovered by the searching party that no doubt would be sent out they would be able to deduce from perusal of the material still remaining in the case that I had been engaged in mortal combat with the super-powerful forces previously mentioned and that my objective had been good tubes at a fair price, within the reach of all, with unlimited freedom as to the use they were to be put to. No doubt they would erect over my grave the usual mark of esteem awarded all experimenters for exceptional effort exerted in the promotion of Amateur Radio, i.e., a radio mast of imposing height with the words,

HERE OSCILLATES BRECK

May he ever be free from QRM
and female operators
and
May his decrement never exceed
.2

My heart swelled with pride at the thought and at this instant I struck the earth and knew no more.

After what seemed an interminable length of time I returned to consciousness with the realization that my head seemed about to burst and after my blurred vision had somewhat cleared itself, I came to the conclusion that it was the blue painted ceiling of the radio room at 8XB at which I was gazing, and not the blue sky above that open field. I further realized that I lay sprawled flat on my back on the floor with what had been a perfectly good pair of Baldwins lying in a dozen pieces alongside of me. Staggering to my feet I felt strangely weak and helpless as I managed to right the operator's chair which I found in one corner under the table containing the instruments and flop into it. After a few minutes I began to feel better and I then became conscious of a strange burning sensation which seemed to center in each of my hands. Gazing down on them I saw that the fingers of each were blackened, and then suddenly everything became clear to me.

While engaged in working on the radio telephone, the heat of the afternoon had evidently taken effect on me and I must have fallen asleep with my head lying upon my arms on the operating desk. I had no doubt left the motor generator running which supplied 1500 volts D.C. to the plate circuit of the phone, and in some manner while asleep, I must have come in contact with the 1500 volt terminals of the panel and received a terrific jolt which threw me backwards off the chair and at the same time rendered me unconscious. Ah, yes; it was all clear now.

Half an hour later I rose from the chair and nursing a lump on the back of my head that felt as big as College Hill, slipped on my coat and left for home, thanking my lucky stars that it was only a dream.

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Downward, Ho!

DID it ever occur to you that the average wave length used today by general amateur stations is much what it should be if the low said that no amateur should use a wave length **less** than 200 meters? Think about that for a minute, and then reflect that what the law says is that no general amateur station shall use a wave length **in excess** of 200 meters. See the difference? This radio law is the document that permits our existence, and its provisions must be obeyed.

Much improvement has resulted in this situation since we started talking on the subject in QST but there are many of you men who still think it's the other fellow to whom we are talking. Honestly now, what's **your** wave length? If you don't know, it is your business to find out. If it's over 200 meters you should cut it down—yes, stop operation until you get it fixed.

We can write editorials on this topic "until our mind changes" and do no good unless we succeed in impressing each individual reader with the idea that it is really essential for the good of Amateur Radio that each individual do **his** part and make sure that **his** wave length is not over 200 meters. That is the idea, fellows: each of you must take this thing to heart and become aware that the A.R.R.L. considers no amateur a good one who uses in excess of 200 meters on a general amateur license.

It's the order of the day, O.M.

The Berries!

THE way C.W. is making good all over the country brings joy to our heart. The skeptics are one by one beginning half-heartedly to tinker with it, and once they do there is another spark set for sale, for the quiet little C.W. set has a way of putting over the traffic that endears one to it immediately. We like to talk about the advantages of C.W.—it's really an inexhaustible theme, the energy is all on one wave length, the decrement is zero, the heterodyne amplification is enormous, and the signal-stray ratio is vastly improved by oscillating reception. It's not difficult, and mile-for-mile it's no more expensive than the spark. The objections to it, where they exist, are mostly sentimentalism, and will not stand the searchlight of scientific progress. Fellows, the good old spark is going, and we might as well get ready for it, because C.W. is working rings around it every night in the year.

Do you know that there is a little world of C. W. stations entirely apart from your own, bumping across traffic every night without your knowledge and regardless of the spark QRM under its nose? There is. Just for an example consider 1AE, 2ZL, 8ZV, 8ZG, 8YG, 9XI and 9XM, who nightly on about 350 meters are hard at it on straight C.W. and getting thru where either QRM or natural conditions have always made spark work extremely difficult. 2ZL with his two U tubes and 3.75 amperes in the aerial has been copied QSA at 5ZA, and works Texas stations like a dream. The other stations are not nearly as powerful—ten watts, most of them—yet any of the bunch will completely outclass a 1 KW spark set in actual work. The reason you haven't heard these stations, and the many others like them scattered all over the country, is that it seems to take a C.W. man to listen for a C.W. signal, so that we find them working among themselves—and leaving the rest of us behind. In the vernacular of the day, straight C.W. is "the berries".

If you would like a practical demonstration of what C.W. is doing, start your bulb oscillating and carefully run over the tunes up to 375 meters. There's business there you never dreamed of, and when you hear how easily it slips thru we'll wager you too will want in on the new game.

A word to the C.W. men! Sign once in a while. Remember that the west coast fellows have listening hours and eastern C.W. signals are getting thru but they don't know who you are because, they say,

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you don't sign very often. Try it—but watch out for the flock of postal cards.

Progress

AN interesting piece of radio literature has found its way into our cubbyhole—the 1912 official call list of the Chicago Wireless Association. It was printed only nine years ago, but that takes it back to Ye Goode Olde Days in Amateur Radio, because, as we have often said, things have a wey of moving fast in this game of ours.

When this book was printed the Radio Act of 1912 had not been passed and two-letter calls were used, with the Morse code the standard instead of Continental. The rudiments of the now famous Chicago Plan are evident in the association's old "Rules," and some of their agreements are golden today. For instance: "Contention for the use of the air is a waste of time and is prohibited;" "Avoid all unnecessary repetitions, such as 'OM,' 'GE,' 'HI,' etc.;" and this one: "Members of the Association are requested to use tolerance and forbearance in their dealings with others." Others of the rules, however, are an interesting commentary on the development of Citizen Radio.

Rule No. 22 says that members must not call government or commercial stations. Most of the present day amateurs have no idea that such a thing was ever done, but it was. And get this, you men: "Rule No. 10—Members will not use transmitting apparatus after 11:00 p. m." Shades of the original Boiled Owl! and today DX does not start in Chicago until 11!

Many familiar names are among the old list, among which are W. J. McGuffage, old "MS" and the association's Chief Operator with the maximum DX record of those days of 90 miles; "HD," Mr. A. A. Howard: "RO," Roy Haynes; "GX," F. H. Schnell, our Traffic Manager of today; "PF," P. S. Pfeifer; and believe it or not, the entry that made us think of the wonderful development separating that day and this: "RM—R. Mathews, 5030 Kenmore Avenue; miles worked 4."

Yes, it must be true—it's our own Matty of 9ZN. Can you imagine a 9ZN with a proud record of 4 miles? Don't you believe us when we say that we have progressed?

Think of 9ZN of today, with a record of close to 3,000 miles and copied innumerable times in every state in the Union; go back just six weeks and recall the Transcons, with that same "R. Mathews" at his key in Chicago spanning the magnificent distance to Roswell, New Mexico, as easily as tho it were a small fraction of his original four miles, and making possible our Transcontinental record of 6½ minutes.

Progress? Yes! And "Ever Onward" is the rule in our organization. The technique of radio has made such rapid strides and is even now experiencing such swift improvements that the most sanguine among us dare not prophesy. Nine years from now—?

The Radio Ladies

WE have just had our lunch, and it was a good one, and while our coat is still on, our shoes bright and our general appearance somewhat amplified, we will say what we have on our editorial chest about our new sisters—The Radio Ladies.

Whether it was the World War, or Woman Suffrage or Sun Spots that caused it, we do not pretend to know, but, whatever it was, the fair sex are sure coming along. One of the last things we expected to take place was the advent of Woman in Amateur Radio. There seem to be so many things in amateur radio that are foreign to Women. It causes us to pause and gasp, for example, to consider the spectacle of a woman digging in a ground system, or operating a blow torch, or ascending to the ridgepole of a house by means of a ladder which is never quite long nor steady enough. We question things, when we think of a woman or girl upending a sixty foot mast pieced together from very doubtful lengths of two by four. And when it comes to sitting beside a rotary gap which is snorting blue fire and emitting ear splitting shrieks, we cannot refrain from wondering. But these things have actually come to pass. Our fair sisters are stringing wires, subscribing for QST, framing membership certificates, putting on A.R.R.L. pins, and climbing trees and ridgepoles. Pretty soon they will be sniffing around closed and open circuits, asking leading questions about fundamental wave lengths, making discoveries in the field of resonance, and recording objections to certain fists. It is only a matter of time before one of them will horn in and show that some old-timer brother has all along been working on simple regeneration only when he thought he had one step amplincation. Then we of the sterner stuff will wake up to the fact that time has wrought great and wonderful changes. Only the other day we read that some authority on automobile road traffic had stated that the figures proved that the average woman automobile driver had more judgment, lost her head less, and caused fewer accidents and observed the traffic laws better than the average male driver. This strikes us as going some, but even it is not up to the record that

(Concluded on page 64)

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Engineering Library

THE OPERATING DEPARTMENT

F. H. SCHNELL, 1MO
61 Waverly Bldg., Hartford, Conn.
TRAFFIC MANAGER



OF course the most important thing this month is the Transcons. We are all entitled to feel proud of our achievement, and the Traffic Manager wishes to express his cordial thanks to all amateurs for the splendid co-operation which made these results possible. As the Transcons are covered in detail in the leading article in this QST, no further mention of them will be made here.

Reports

Several very good reports were not included in last month's issue, simply because they were not in this office on the FIRST of the month. Our forms close on the first without fail. If you desire that your division be represented in QST, you must assist your Division Manager by getting your reports in to him on time so that he has time to compile the complete report for the Division.

Total Messages

The number of reported messages handled in all divisions in January totals 8084. This is not a complete count of all traffic by any means. The total for all divisions should be somewhere near 25000. It goes without saying that hundreds of stations do not send in their traffic reports and it is known that a great many of these handle more than 100 messages per month. For the benefit of your division fellows, forward your traffic report to your Division Manager, and let us see if we can reach the above total. Do it every month and our total messages will grow. The main reason why the Central and Mid-West Divisions have such a large total is because almost every man in the division sends in his report, and if everyone did the same in the other divisions the reports would be far better and more complete.

Honor Position

Following each division report will be found the total number of messages handled in each division, and the name of the owner of the busiest station or the individual station handling the most messages. In the introduction of the Operating Department Report, we will have an honor position each month, given to the station that has handled the most messages during the reported month. The honor position this month goes to

January, 1921
MR. R. H. G. MATHEWS
9ZN, Central Division
370 MESSAGES

December, 1920
MR. W. S. TAYLOR
9CA, Central Division
386 MESSAGES

Now if you fellows get on the job, 9ZN is going to be hard pressed to hold that position. Last month 8ZL was so close that the only reason 9ZN was able to hold out, was that he sat up on January 20th and handled 63 messages. Quite a few, but if he can do it, some of the other Boiled Owls can do the same or better. If you want the honor position you have got to move traffic.

Improvement in Southern Sections

Our little SOS for stations in the southeastern part of the United States bore fruit. We located some stations and the outlook is more than bright. Mr. H. C. Wheat, Gaffney, S.C., is going to have a real transmitter second to none. Plans are now under way for the installation of same. This is a most joyful piece of information and this station will span the gap from Florida to the north. Just the place for a good station, and one that can be kept busy all the time.

Conditions

The Transcon Tests revealed what could be done if we had no QRM. Just glance at the Calls Heard and the station reports. For the first time in the history of the A. R. R. L. all districts have been heard, and by more than one station. Perhaps there are others, if so, send in your records. We cannot hope to absolutely cut out all QRM, but it is quite possible that much of it can be reduced by a little foresight on the part of a great many stations. The international abbreviation "QTC?" is being run to the ground. Some stations still persist in calling a station or "CQ" for at least nine times and signing nine. It is the same old story. How many of you have listened to this same thing and noted that just

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before the station signed the signals faded out? It is a fact that many more stations would do better work if they called a lesser number of times and signed the same way. Follow the radio regulations fellows, call three times and sign three times.

With all the QRM, traffic has been moving regularly in every direction and more consistently since the men have started in real earnest to deliver messages. The monthly reports follow:

DELTA DIVISION
J. M. Clayton, Manager

It is gratifying to note the amount of co-operation the members of this Division gave in the recent transcontinental relays, and it is due mainly to this that the messages through this division were forwarded, in such good time. Quite naturally ALL the stations can't be in on all the transcontinental relays, but all can co-operate and the Division Manager is especially proud of the stations in the division for their hearty co-operation in this matter.

Especially good work was done by 5YH and 5ZP in the relays. But the rest of the fellows have shared in the glory of it all as much as the transmitters, for without some control of QRM the messages would never have gotten through.

It is hoped shortly that there will be several medium powered CW stations in the division to help solve the problem of good traffic work. Quite a number of the northern and eastern CW stations came through in fine shape almost all over the division and it is needed here to help relieve the QRM.

Mr. Hutcheson, 5DA, Superintendent of Tennessee, reports prospects at Knoxville, Memphis, Chattanooga and Cleveland. 5ER at Nashville is getting through in fine shape and is handling traffic for his state. 5ER and 5DA are the only regulars in Tennessee. 5DA handles traffic north and east but is having a very meagre success with southern stations. Mr. Hutcheson promises steady watches at 5DA.

Mr. Barrow, 5EA, District Superintendent of Louisiana, reports all Louisiana blooming. The following stations in Louisiana are doing DX work now: 5ZP, 5ZK, 5EA, 5ZS and 5JE. Mr. Barrow expects several additions to the above list within the next month.

Willie Anthony, 5ZS, City Manager of Shreveport, is the speed king of the district. The quickness with which Willie has been getting traffic for Shreveport and getting the answers back has been highly appreciated by all. Mr. Guy Hanes has consolidated with Anthony. The Division Manager had the pleasure of meeting Anthony during December, and is certainly pleased at the equipment 5ZS boasts of.

Mr. Barrow has at last discarded that quenched gap and with the new rotary pounds in in great shape. He is centrally located and is doing excellent work. The quickness with which 5EA clears the hook is remarkable. It is reported that the pin upon which he keeps his msgs is warm always from the continual taking off and putting on of traffic.

Mr. Francis L. Pullen, City Manager of Houma, Louisiana, has made several changes in his station. Signals much better than usual and he has been doing some very nice work with the new arrangement.

Mr. Greenlaw, the Traffic Chief of the Division, has been working up a scheme for handling messages throughout the division. 5ZK comes in great at Little Rock, and he has handled considerable traffic with 5JD

New Orleans has nothing new to report. The Division Manager had the pleasure of meeting the biggest part of New Orleans, deBen, 5ZP, while 5ZP was on his way to the Midwest Convention. It is a pleasure to listen to the perfect code that goes forth from the hand of ZP and our friend 5YH. The New Orleans QRM continues to multiply by the Ford-full, and 5ZP continues to bat 'em out as much as ever.

At Little Rock, 5JD, Kinsolving, has been doing some very good traffic handling. With his help and with 5YH the traffic goes through this part of the division in fine shape. 5JD is a new man at the game but he handles traffic like an old timer.

5YH has been doing some exceptionally fine work during the month and continues to be a main link in the traffic chain throughout this section.

The Division Manager has been minus a sending station for over a month, but is going to get it back as soon as a new pole can be put up. He also contemplates installing a C.W. set very shortly. In the meantime he hopes to catch up on his Division correspondence and take an occasional trick at 5YH, through the courtesy of Lieut. Baldwin.

It is quite important that all stations in the division send in the list of messages received and messages sent, to the Traffic Chief, 5ZK, by the 23rd of each month. Also don't forget the list of calls heard.

Total messages 470. Busiest station 5ZL —168 msgs. J. M. Clayton, 1301 Welch street, Little Rock, Ark.

EAST GULF DIVISION
E. H. Merritt, Manager.

We are very much encouraged with the "life" being shown by the Florida stations now. 4AM, 4BI, 4CB, 4DI, 4AO and 4DW are some of them being heard often.

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although no traffic has been handled yet by them. If these men will co-operate with us and "discover" a few more stations, we will be able to work a relay route through to the "Cow's Tail" soon. Stations in West Palm Beach are in reliable communication with Bimini, one of the Bahama Islands, but they can't work north.

Cards were sent to all stations in the Division about the Transcons, and there was less QRM from us than from any other Division. All the fellows wrote that they would QRX, but the Florida men asked who ever heard any QRM from them anyway.

South Carolina still has only one man, 4EG. He has a good set but is unable to connect up anywhere. Are there no spark coils in the state even? Please write us if you have any kind of a set.

Georgia men are doing good work, but can't go south. There are eight Atlanta stations being heard now, but very little relay work is accomplished. Atlanta stations will not be open for DX work until after 9:00 p. m. C. S. T. Dr. Hodge, City Manager of Savannah, reports that they have three stations there working DX, with 4YB and 4BY the best. 4XB is having remarkably good results with fone and CW. 4BY wants to know if the southern men are all on vacation or if the Fading God has put his 'Woofhong' into their signals.

Superintendent McIlvaine of Alabama, 5XA, reports ND from his station yet except 5XA. The Birmingham men are forming a radio club and will get several sets working there soon. 5XA calls attention to the peculiar atmospheric conditions on January 9, 10, 11. On these nights he heard only two 9's and NO 8's, although they are usually the best. 4's were ALL good and several FLORIDA stations were worked with no QSS. The same conditions were noticed in Atlanta by 4AI and 4 on the night of the 11th, and nearly all the QSS tests were missed.

Total Messages 100. Busiest Station 4YB —34 msgs. K. of C. Savannah, Ga.

ONTARIO DIVISION
A. H. K. Russell, Manager

Traffic is moving slowly along in the Ontario Division, but is vastly improved from the earlier part of the season. Toronto has now many stations who are working easily across the border into New York and Pennsylvania, and quite a bit of traffic has gone forward through Niagara Falls and Buffalo. The installation of the various CW sets has been delayed a lot through the tube situation as delivery seems to be held up indefinitely on bulbs, particularly those from England.

A beginning has been made in eastern Ontario to get traffic through, and Mr. W. A. Caton, of Napanee, has been appointed Manager of South-East Ontario, City managers have been appointed in Kingston and Belleville, in the persons of Mr. Orton Donnelly, 3HE, and Mr. H. R. Woodley of Belleville. Communication has been opened between Napanee and Kingston.

Southern and Southwestern Ontario report steady but not rapid progress, and Kitchener reports the erection there of a high power spark station at the High School

NORTHWESTERN DIVISION
J. D. Hertz, Mgr.

Now that the Transcon tests are over we are turning our attention to the more everyday work of getting traffic through efficiently. While it was proven that a message could be gotten from one coast to the other, and an answer back the same night, it is very seldom that a regularly handled message gets through one way in twice the time.

North and south traffic gets through the Division without delay. But business destined for the east finds going much harder. The difficulty seems to lie between 7CC and 7EX or 7ZG. It is comparatively easy to get through to 7CC, or 7YA, and 7EX and 7ZG report that they have little trouble working any number of Nines. But 7EX and 7CC can't seem to hook up on account of QSS, and the same difficulty is experienced between 7CC and 7ZG. Certain nights both 7EX and 7ZG are QSA in Portland, usually both being heard the same nights. 7CC does not have this difficulty working 9EE and 9WU, but on the other hand both of these Nines are bothered by QRM.

The following stations in the western part of the Division have been taking an active interest in relay work: Seattle, 7AD, 7IU; Tacoma, 7BC and 7CE; Portland, 7BP, 7ZI, 7BR, 7DS, 7ED, 7JW, 7GA; Vancouver. 7ZJ, 7BJ, 7ZK; Silverton, 7IN, 7CW; Salem, 7BH; Eugene, 7GQ, 7HF, 7HN; Kelso, Wash., 7BV.

Dann, 7JP, at Astoria is back on the job after a month and a half vacation.

Milton Koupal, 7GQ, Eugene, Oregon, has been appointed District Superintendent for the southern part of Oregon, succeeding DeGuire. He reports that northern stations heretofore faint or inaudible are now QSA, but still very QSS. 7FB at Marshfield is QSA.

Miss Dow, 7CB, at Tacoma. reports that during the Transcon tests the entire locality was "well behaved," and no QRM was experienced. (We wish to thank the Tacoma Radio Club for the support it is giving Miss Dow in A. R. R. L. affairs.—D. M.)

Teed, at Kuna Idaho, says that the

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Martin Bros. station has been licensed under the call 7LN. Also says that 7YA is doing good work. 7FT promises to be on shortly.

Mention might be made here of the work done by 7DA and 7ZJ in connecting up with 5ZA. Both of these stations have also heard 9ZN, and on one night when 7DA gave 9ZN a call he was copied at Minonk, Ill. He has also been heard in Texas, also at 9LR. 9LR is also among the ninth district stations heard in Portland by 7ZI. 7ZJ reports hearing the following: 9EE, 9AE, 9AIG, 9WU, 9ZQ, 9OE, 9ZN and 9ZJ.

Regarding the Transcon tests, great credit is due the boys who QRX'd for the messages. There were but few cases of apparent anxiety to fill the air with noise. Credit is also due those who were lined up for the test, but who did not get a chance to prove their worth, and finally, credit is due to those who actually took part in the relaying. These were few in this division, namely 7ZG, 7CC and 7DA. All of these stations are to be complimented for their fast work under the trying conditions of poor operating weather.

Total messages 391. Busiest Station 7CC —262 messages. Jack Woodworth, 107 Alman street, Moscow, Idaho.

DAKOTA DIVISION
Boyd Phelps, Mgr.

Relaying has taken a big jump with many stations during the last few cold months and many new records have been hung up during the good weather. Stations 9WU, 9EE, 9ZC, BQ, 9HM, 9ZT, 9XI, 9TI, 9AIG, and 9UT have been doing most of the relay work to points outside of this Division. Others "step out" occasionally but not consistently. 9XI and 9ZT have gone CW crazy, so temporarily 9HM has been handling most of the traffic to the Twin Cities.

Many stations have been popping up in the small towns about the Division which makes the prospects look better for daylight and summer routes. However, it is felt that there are still quite a few fellows that have sets capable of some distance who have not written in yet. Branch route appointments are being made as fast as good stations can be arranged in relay lines. Amateurs outside of the larger cities are urged to write to the Division Manager to see in what way they may help.

In the Transcon relay tests the station of Mr. Leavenworth, 9WU at Ellendale, N. D., was the star station in this Division. Prospects looked poor when plans were first started but considerable testing was done and alternate routes arranged whereever possible. The outcome is now radio history.

Mr. J. A. Gjelhaug, District Superintendent for Northern Minnesota, wishes to announce that communication is now open with Canada through his station 9ZC to 4AM at Winnipeg. It seems that our Canadian cousins are getting tired of long wave reception and are beginning to build short wave receiving sets. We have been hearing some of them for quite a while but just lately, due to the efforts of Mr. Gjelhaug we are able to connect up with them regularly and open up for relay traffic. We welcome your traffic.

ROCKY MOUNTAIN DIVISION
M. S. Andelin, Mgr.

The Division Manager has made a trip through Utah and visited nearly all the DX stations of the state and is very pleased with the work done. Stations in this division have a condition to contend with that is not prevalent in any other division to our best knowledge. That is the difficulty of working stations located in the mountains. While most of the DX stations find no difficulty in working stations outside of the division and have a reliable working range of several hundred miles they experience the greatest difficulty trying to work intermountain stations. Fading signals is the greatest obstacle, then wave length changing comes next. The writer notices this particularly between Salt Lake City and Richfield stations. Stations in different localities fade out of receiving range for days at a time then come in doubly strong for a similar period. These conditions are noticeable on the short wave lengths more than on the longer ones.

This month the bulk of the traffic has been handled by 6ZA, 6ZH, 6ZM, 6JT, and 9AMB. Our western traffic goes via 6ZO, formrly 6BQ, also almost any coastal DX station. Eastern outlet is via 5ZA, 9LR, 9WU and others.

The transcon relay went through this division as scheduled but on several instances was helped out by 5ZA and 6IG. The messages went direct to either 9LR or 5ZA and were not sent via the Denver district because of inability to work those stations at that time. Mr. Kaar, Assistant Division Manager, reports favorable developments in northern Utah and is well pleased with the co-operation shown by the members in this division.

Total messages 397.

WEST GULF DIVISION
Frank M. Corlett, Mgr.

To those that did not attend the Mid-West Convention, you do not know what you missed. It was a great success. It was more than a pleasure to meet the many CITIZEN RADIO MEN that were there. To the St. Louis Committee I take off

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my hat. They did the job in good old A. R. R. L. style.

The Transcon tests were sure a great success, because of our splendid A. R. R. L. Organization, which made it possible to send a CITIZEN RADIOGRAM from HARTFORD, CONN., to LOS ANGELES, CALIF., and GET AN ANSWER BACK within 6½ MINUTES. THINK OF IT! To the stations actually doing the work much credit is due but to the 250,000 station owners who STOOD BY and kept the air clear during these tests a still greater credit is due for they are the ones that made this record possible. The co-operation was wonderful. This is just an example of what ORGANIZATION and TEAM WORK will do.

All TRAFFIC and MONTHLY reports should cover the period from the 15th to the 15th of the month. All reports should reach the District Superintendents by the 18th of the month. Aside from a general report covering activities in your Territories or cities, your reports should include the NUMBER OF MESSAGES HANDLED by ALL STATIONS in your Territory or City. Messages received for transmission or delivery LOCALLY count as MESSAGE handled. Messages RELAYED, received and retransmitted count as TWO MESSAGES handled. Remember this in making your reports and list them so many "CITY" and so many "RELAYS." The STATION REPORTS as requested in Division Letter dated December 15th shoud be a separate report and forwarded along with your other monthly report to your DISTRICT SUPERINTENDENT. STATION REPORTS will be published in QST under a special department created for this purpose. To make it a success your reports are necessary.

The traffic reports this month that were received in time to include herein indicate activity throughout the entire Division which is pleasing to all of us who have endeavored to make this one of the TIP-TOP Divisions.

District Superintendent Falconi of the New Mexico District sends us a brief but interesting report on conditions throughout his District and is indicative of the effectiveness of his labors, and we desire to congratulate him thereon.

Mr. W. S. Bledsoe has been appointed Asst Dist. Supt., in charge of the Elpaso Texas Territory, and through his efforts, together with those of Mr. Falconi, traffic to El Paso is now being handled via 5ZA, 5ZJ and 5XD, with clock-like regularity.

Mr. Livingood of Las Vegas reports much interest in radio in his territory and improvements in results are rapid.

It is unfortunate that there are no stations in some of the larger cities of New Mexico, and we are very interested in getting a station going at Santa Fe, Albuquerque and Silver City, and anyone who should know of any data on any station at either of these places will do Mr. Falconi a favor by advising him of the fact.

The Southern Transcontinental Route is as busy as bees now-a-days, and is not unusual to handle as many as thirty and forty messages to and from the West Coast, and let us say that due credit should be given 6IG for making this route so dependable.

The Transcontinental Tests went through 5ZA as smoothly as could be desired with exception of the first evening, when a mistake in dates by several stations on this route caused confusion and much delay. The two following nights, however, brought some highly efficient operation, especially on the evening of the second test, when the message was lifted from 5ZP direct and handed to 6IG, and westward. On the third night the message went via 5YH, 5ZA, 6IG and Coast. It took just about as long for this message to grind through these stations as it takes to tell the story.

In the Special-Time-Test, at first 6ZK connected with 6JD, then to 5ZA, 9ZN and 1AW. The first message went through these stations. The answer from 6ZK was copied at 5ZA direct and thence to 9ZN and 1AW. Later connection was lost with 6ZK due to rain storm, and 6JD, found it very difficult to keep his tubes going, the QRN killing them. However, this station was made the west terminal in place of 6ZK and many more messages went to and fro.

The situation in the Austin Texas Territory according to Asst. Dist. Supt. Rives' report, is practically unchanged.

The Houston Texas Territory, as Mr. Daniels, Asst. Dist. Supt., reports is encouraging, with stations at Galveston and Port Arthur soon to be open which will give us an outlet to the Gulf.

Thus far in January many good records have been made, and traffic has been moving nightly, together with a considerable amount of day-light work.

Nearly all Houston stations can work 5BI successfully as early as six p. m. and quite a bit of traffic has been going north by that route.

Of special importance from an information standpoint, are the two new special stations in Houston: 5ZE, B. J. Still, testing station of the Hurlburt-Still Electric Co., radiophone concerts every Sunday on 375 meters from Edison phonograph with new Magnavox Transmitter and DeForest Phone between 3 and 4 p. m. 5AO now bears the call of 5ZX.

The Houston Radio Club sent two representatives to the Midwest Convention and

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their trip was related for the benefit of the club at the last meeting.

Much useful information was obtained first handed, and by the representation, stations and conditions existing in this locality will be better understood by other state citizen operators.

We are pleased to announce the full recovery of 5EO of Freeport, Texas, who has been ill for something like four months.

5KQ of San Antonio is now working and has been heard in Austin, but he does his best work with 5YK at New Braunfels.

A little note reaching headquarters this month states that 5HV of Commerce, Texas' handled 64 messages.

We desire to announce the appointment as District Superintendent of Lowrin G. Dill of the state of Oklahoma. His address is 234 Broadway, Oklahoma City, Okla., and we wish him much success in his new office.

Asst. Dist. Supt., C. M. Selby of the Muskogee Okla. Territory reports Mr. Bryce Ballinger of Miami, Oklahoma, is to have a station going soon, and that Mr. Sams and Tantum are installing a three-quarter K. W. in Muskogee.

Asst. Dist. Supt., M. C. Poor, of the McAlester Oklahoma Territory, is getting on the job and doing some splendid organization work, getting all the fellows lined up and going.

Total messages, 861. Busiest Station, 5ZA—286 msgs. Louis Falconi, Roswell, N. M.

NEW ENGLAND DIVISION
G. R. Entwistle, Mgr.

Several complaints have been made lately concerning reports from relay men and district superintendents by the Asst. Div. Mgrs. This subject has been discussed repeatedly but let us try hereafter to get out reports in, in this manner:

Relay men to Dist. Supts. before 15th of month.

District Supts. to A.D.M.s before 20th of month.

A.D M.s to Division Manager before 25th of month.

A.D.M. Robinson (1CK) reports that Northern New England seems to be returning to the radio map again and 1UQ, 1FV, 1UL, 1RAY, 1DAC, 1YB, 1OE and 1CM are almost nightly visitors around Boston. 1RAY seems to present a very good route through to Canada without going through any more stations and he is easy to work from Boston.

Thanks are due to 1AB, 1CZ, 1AI and 1EP for helping out on getting the Transcons into Boston.

1AE, 1AK and 1KC are recent additions to the CW end of the game around Boston.

A.D.M. Mix (1TS) reports matters having progressed in fine shape during the past month, although there was a slight decrease in actual traffic handling on account of the Transcons and QSS tests.

D. S. Nichols reports west bound traffic being handled fine but as having a little difficulty in getting traffic north. Mr. Nichols has his aerial and counterpoise up again after it was completely wrecked in a storm

D. S. Randall of Hartford reports great activity in his section, in fact too much activity at times. 1RU has been doing fine work on his CW set this month, stretching out to Chicago, Wichita and Savannah.

During this month several stations have done notable work. 1AW and 1BBL were in on the ARRL Transcons and did fine work. 1AW and 1BBL also have been serving as transmitters in the January Bureau of Standards QSS tests while 1NAQ and 1TS were serving as additional recorders.

1NAQ and 1JQ did fine work in reporting the large fires in Springfield and Tariffville to the press and also notifying the Hartford Fire Department to be ready in case outside aid was needed. D. S. Randall reports that two of the DX stns. in the vicinity of Hartford persist in working before 10 p. m. which is in violation of the rules laid out by the Radio Club of Hartford which provides that DX men suspend operation until 10 p. m. when the coils etc., will then stop and allow the DX men to work unmolested. Why isn't this a good ruling for the whole Division? Also there is a large amount of testing being done by some of the DX men around Hartford after 7 p. m. It is hoped that this will not continue.

Boston City Manager's Report
P. J. Furlong.

The time schedule which was recently put into operation has received splendid support locally. However, there are a few stations operating with spark coils straight in the antenna that cause QRM after 10 p. m. Many of our local DX men, who expect clear air after 10 p. m. show an entire disregard for time periods "B" and "C" on the schedule. Full power is used for local work which means the lower powered station has to stand by.

Some of our local "CW" stations are probably not aware of the time schedule, judging by their actions. A copy was mailed to every amateur in the 1st District and also published in a recent issue of QST. If you have not received a copy, one will be mailed you upon request.

On several nights during the fading tests, the work of some of the recorders was made valueless owing to the thoughtless operation of some local would-be "DX" stations. The apparent quiet could

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not be understood, so things were brightened up by many long drawn out "CQs."

Total messages, 125. Busiest station 1BM 61 msgs. H. E. Nichols, 513 Pequonnock street, Bridgeport, Conn.

PACIFIC COAST DIVISION
E. G. Arnold, Asst. Mgr.

Many changes for the better have taken place west of the Rockies since the last report appeared in QST. Practically all the good operators, (25 words per minute boys) are with the ARRL. We are glad to report at this time that the Bay Counties Radio Association have affiliated with the League.

Santa Barbara has been dead as far as radio goes for some time, appearing to be in a sort of pocket, but now we have a real operator, Mr. Roebuck, 6AAK, and a good station there. He deserves much credit for the manner in which he has been handling traffic.

6JD, 6ZN, 6EN, 6ER, 6SK are also deserving of praise due to the manner in which they have been handling relay work in their locality.

6JI of San Diego is now working north and east very well regardless of NPL mush.

6IG of Douglas, Arizona, is also working to the coast fine, having worked old 6BJ, now 6ZR, of Burlingame, three nights in succession.

We are sorry to report at this time that Mr. H. Shaw, 6BN, of San Francisco has discontinued his radio activities. We still have the old reliable 6OC who is a good operator and does everything he can for our league. Regarding traffic around San Francisco, before the war no great steps were made but now the conditions have greatly changed. Hall Berringer, 6ZR, formerly 6BJ, has taken matters in hand. He has two complete transmitters, 200 and 375 and is handling the traffic through the QRM in a remarkable manner.

Our manager, Mr. A. E. Bessey, has been doing some wonderful work. Upon his arrival home from the St. Louis Convention he received a card from Ohio stating that 6ZK was QSA in Ohio.

We can not give Vance Wise, 6EJ, enough praise in this column. He is one of the steadiest men on the job, on the Pacific Coast. 6AK of Walnut Grove is also doing excellent work. We have a new 500 cycle quenched transmitter in Stockton, 6FI, which is doing fine work. A long needed station in Ukiah has now been found in the hands of a good operator, 6OH. He has been doing some fine work.

Due to the efforts of our manager, Mr. Bessey, we have developed a QRX period, Monday and Wednesday nights between 9 and 10 p. m., making it possible to hear many stations to the East. We wish to extend our thanks to the many who are co-operating with us on these nights.

Best route to the east: 6ZO, 6ZA or 6ZM. Best route east via south: 6IG, or 5ZA.

5ZA reported heard by 6ZK, 6ZR and 6AT, actual communication was reported established with 7CU, Mumford Bros. of Vancouver, Wash.

ROANOKE DIVISION
W. T. Gravely, Mgr.

This Division has seen greater activity during the past few weeks than ever before in the history of the ARRL. Many new stations are being erected, and the old ones are becoming more efficient each week. The greatest draw-back, however, is the tremendous amount of QRM, which is ever-present, and which is the cause of the failure of many long distance stations to carry traffic through in better shape. I am sorry to note that unnecessary QRM is rapidly growing, and to curb this evil as much as possible, let us of the Roanoke Division refrain from making unnecessarily long calls, as a beginning.

It is most pleasing to report that I have had letters from individuals in other Divisions commenting on the fine co-operation of the stations in this Division, and especially does this apply to those on the Seaboard. It makes us proud to have such things said of us, and to all of you who have shown such a fine spirit of co-operation we extend our thanks

Mr. Jno. F. Wohlford, 3CA, District Supt. Southwest Virginia, reports a great deal of activity in his section. (Note; 3RF is now William S. Creighton, 434 Washington Ave., S. W., Roanoke, Va.

Mr. Wohlford deserves a great deal of credit for the splendid pioneer work he is carrying on in his District.

Mr. C. D. Blair, 3ZL, District Supt. Central Virginia, reports conditions very satisfactory in Richmond. He states that on January 17 the amateurs of the city met at the High School and formed the Tri-County Radio Club, with an initial membership of forty. Mr. G. C. Robinson, 3NG, was elected Secretary, and Mr. C. D. Blair, 3ZL was elected Advisory Chairman.

3TJ is temporarily out of commission, as well as 3ZL and 3UU.

Mr. Blair states that he is determined to link Richmond in with all of the lines, and to become an important clearing point in the Division.

Mr. F. L. Bunker, 4CE, District Supt. North Carolina, has a most enthusiastic report. The Manager has just been honored with a most delightful visit from him, at which time field conditions were dis-

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cussed. He has requested that Mr. Gluck, 4CQ, of Charlotte, be appointed Assistant District Supt. for the State of North Carolina, and in future Mr. Gluck will occupy that position. He will have his station, 4CQ, in full blast by February 15.

Mr. Bunker states that there will be three 1K.W. stations in operation at Charlotte, namely; 4XD (he is now doing work nightly, with a C. W. outfit,) 4CE, 4CQ and 4FO.

3EN. Mr. T. C. White, Jr., City Manager, Norfolk District, reports all DX stations in his District in operation during the past month, except when his own plant was temporarily disabled, due to a fallen mast.

3GO, Mr. Hopkins; 3VV, Mr. Kubiac; 3FG, Mr. Herndon; 3AB, Mr. Gilpin and 3EN, Mr. White have all handled their share of messages, and in addition, station 3ACE, Mr. Koon of Portsmouth, and 3ACT of Norfolk, are breaking into the relay game. Stations 3JX, 3AAG and 3QQ of Newport News are lending hearty co-operation.

It is with pleasure that we welcome Sgt. R. H. Blair back from his vacation. He is in charge of Station XF-1, Langley Aviation Field, Langley Field, Va., and has been doing long distance operation of material assistance to the ARRL.

No change in the QRM from NAM, so Mr. White reports. He says that, in addition to QRM from spark sets, he now uses the Arc, which renders impossible for them to even hear long distance station.

Mr. Heck, District Superintendent, West Virginia, Mannington, writes that affairs in his District are progressing, that many new stations are beginning to operate, and only need to be shaped up to enter the relay game.

Mr. Heck's station has been out of commission.

8SP at Fairmont is handling a great deal of traffic in his section, the northern clearing point for the west in West Virginia.

Efforts are being made to create definite working lines on down through West Virginia, with an ultimate daylight line, into Virginia, and thence on down to the borders of South Carolina.

Total messages 500.

ST. LAWRENCE DIVISION
A. J. Lorimer, Mgr.

Our local reports quite good this month but we are still short "one good relayer to U.S."

Dist. Supt. Buzzell reports improving conditions thruout his district.

Major Stethen has installed a good set at the Cavalry Barracks, St. Johns, P. Q., call 2DD.

He is working the Montreal stations regularly and QSRs traffic collected at 2AX, Stanbridge East. The latter station, equipped with ½" spark coil, has been covering the 55 miles to Montreal direct in daylight but not strong enuf to get thru during interference.

Mr. Buzzell is doubling the power at 2AS shortly. 1GY may work him next time they are QSO.

New stations are reported at Niagog and Sherbrooke.

Daylight freaks seem to be quite common 2AB has been reported several times at Montreal.

No report from the Levis District. There does not seem to be much doing north of Nicolet this season.

Total messages 28.

CENTRAL DIVISION
R. H. G. Mathews, Mgr.

In contrast to the heavy traffic handled during the Christmas holidays, the message relay work during January seems small. However, in comparison with that of the previous ordinary months this traffic is entirely normal. All the District have been handling their traffic in fine shape and we are especially glad to note increased activity in Kentucky. The total messages handled in the District of Kentucky during the past month is 218 and Mr. Kolb, the District Superintendent, and his assistants deserve great credit for the good work they have been doing both in organization and traffic work. For the information of Kentucky stations who wish to get in on the relay organization, the following is a list of the personnel in that state. Operators desiring appointments as City Managers or relay stations should get in touch with the nearest one of these men. District Superintendent, Mr. J. A. Kolb, Jr., 9OX, 1101 E. Broadway, Louisville. Asst. Superintendent, Mr. B. L. Brown, 26 Alexandria Pike, Newport, Ky., 9UH. City Manager of Covington, Mr. C. W. Kleaman, 9VZ, 2011 Garrard Street. City Manager of Louisville, Mr. C. L. Pflumm, 9OX, 1944 Deerwood Ave., Louisville. City Manager of Newport, Ky., Mr. A. C. Hengelbrok, 9IO, 922 Washington Ave.

In the District of Eastern Ohio, we regret to say that we are losing our old stand-by Rev. A. J. Manning, who feels that because of poor health he cannot give his position the time and attention it needs. At his recommendation, Mr. R. D. McCommon, 8FD, East Palestine, Ohio, has been appointed District Superintendent of Eastern Ohio, the rest of the personnel of that District remaining the same. Mr. McCommon is taking over the District this month and it is hoped that he will get the same co-operation from the members of

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the Ohio traffic personnel as did Mr. Manning.

In the Miami Valley District of Ohio the District Superintendents report the following new appointments: City Manager of Columbus, Ohio, Mr. D. S. McDowell, 8EC. City Manager of Dayton, Ohio, Nelson Emmons, Jr., 8TN.

In addition to these appointments the following routes have been formed in the Miami Valley District: Cincinnati and Southern Route: 8ZL, 8FT or 8TN, 8AKV or 8AFS to Kentucky and other southern points Route in daily operation. Columbus Route: 8ZL to 8EC or 8HG in daily operation. On this route there is an excellent chance to connect up with the Eastern Ohio District if the stations east of Columbus will but come forward and make themselves heard. Indiana Route: 8ZL, 9RL to Indiana points north and south Not many nor long routes can be formed in the Miami Valley District because of the size and shape of the District. Those routes that do exist are in daily operation thus giving prompt service to all points in the district as well as connecting with other districts at various points. The District Superintendent would like to hear from any one wishing an appointment.

We regret to say that the District Superintendent of Northern Indiana, Mr. H. H. Moore, has been very ill during the past month. In spite of this fact Mr. Moore has managed to handle his District very satisfactorily, especially in view of the peculiar conditions existing in Northern Indiana. Five of the best stations in this District are out of commission temporarily which is a tremendous handicap. Mr. Moore's work is being limited by the fact that he does not have sufficient stations in his District to carry out any official traffic organization. All station owners in this part of Indiana are therefore urged to communicate with him at 922 Madison St, Elkhart, Ind., at once. Indiana should be the link between Ohio and Chicago and it cannot fulfill this function without the co-operation of every operator.

Mr. H. L. Ley, 8ZV, City Manager of Canton, Ohio, is interested in hearing from CW stations west of Canton with a view to arrange a schedule on CW for west bound traffic. The Division Manager believes that a route of CW stations throughout the Central Division would be of great advantage, especially for daylight or summer work, and the attention of the District Superintendents is called to this means of communication.

The District Superintendent of Michigan has also been ill but has managed to handle his District in his usual efficient style in spite of his handicap. Mr. Darr is employing a unique and interesting method of securing publicity. He is editing a column in the Sunday edition of the Detroit News giving a short article each week, together with answers to questions submitted by readers. This in combination with a radiophone set at the Detroit News is doing much to secure better co-operation among Detroit amateurs. The Detroit Radio Club now has the Chicago Plan in operation and Mr. Darr reports that it is working out in fine shape.

In the District of Wisconsin Mr. Homer, U. Bishop, 9DV, Neenah, Wisc., has been appointed Assistant District Superintendent and given charge of the Fox River branch of this District. Mr. Bishop served in the Signal Corps overseas during the war and saw active service in Germany with the Army of Occupation. He is personally acquainted with the radio men in the towns under his jurisdiction and he certainly will be a big asset to our traffic personnel.

Mr. Burhop is continuing his membership drive in Wisconsin and from the results which are forwarded through this office we believe that he must build stations in order to get their operators in the A.R.R.L. We would suggest that some of the other Superintendents get in touch with Burhop to find out how he does it as he is certainly remarkably successful.

Appointments of official relay stations in the District of Wisconsin are as follows: 9AYE, Mr. W. E. Hanna, Beaver Dam, Wisc. 9AIP, Stanley Fisher, 1572 Packard Ave., Racine, Wisc. 9ACM, Kraus & Steffen, 1611 No. 8th St., Sheboygan, Wisc.

9ZL has been out of commission for several days following the storm of January 19th which carried away both masts. This must have been a real storm since it also took down the steel tower at NTY and since Burhop is connected with both 9ZL and NTY we believe he has had the pleasure of helping put up both aerials.

No January reports were received from the District Superintendents of Illinois and Southern Indiana and no information can therefore be given on the activity in these District during this month.

In the Toledo District of Ohio, the following new City Managers have been appointed: C. C. Endley, 8ZN, City Manager of Mansfield, Ohio. E. W. Tarbox, 8VJ, City Manager of Findlay, Ohio. R. K. Stolzenbach, City Manager of Lima, Ohio.

The District Superintendent, Mr. Duerk of 8ZY, reports as follows: The Assistant Superintendent, Mr. Preston, 8IK, reports the following changes in the branch routes connecting with 8IK. Cancel 8JF, 8OI and 8MM from branch routes #1 and 2. These stations out of commission. Route #1

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should now read, 8IK, to 8HI to Cleveland. Cancel route #2 as there are no stations in Lorain at present who can work out of town stations. 8VS New London, is anxious to get in the game. He operates a CW. set and can handle Huron County OK. Route #3 should now be 8IK to 8VS to 8IZ to Sandusky. 8IZ is now working Sandusky OK but don't know who. Am unable to locate anyone in Port Clinton. Route #4 is now OK as far as 8AJK. Ohio Wesleyan University station formerly "OWU" is now 8YK.

Traffic going to Toledo at present, must travel over Uncle Sam's route, going to Toledo by mail from 8ZY. This is unavoidable at present, but am trying through my city manager 8ZB, with the hope of locating some station there to temporarily handle the traffic. 8ZB is still out of commission. and 8IR, who has been doing such fine work, has been forced to suspend operating his spark set, because of difficulty with the power company.

We now have a positive route, which can handle traffic from Chicago to the eastern border of our Division. 9FS, 9FG, at Goshen are able to work the Chicago stations, they in turn QSR to 8ZY, with 9HR and 9DF as intermediates 8ZY has no difficulty working with 8IK or 8ZR at any time, tho we have 8VJ and 8GB as intermediates, from 8IK we connect with 8ZG's district through 8GE who is always QRK at 8IK, and also at 8ZG. Quite a bit of traffic has been going over this route, and so no delays are now experienced in getting traffic thru. Rev. Manning reports that when traffic gets as far as 8ZG, it is sure QSR east, so we think we can relay Chicago traffic to New York over daylight relays.

Total Messages Dec. 3274. Busiest station 9CA, W. Taylor, Minonk, Ill.

Total Messages Jan. 3085. Busiest station 9ZN, R. H. G. Mathews, 1316 Carmen Ave., Chicago, Ill.

MID-WEST DIVISION
L. A. Benson, Mgr.

The Division Manager desires to thank all of the division personnel for the splendid co-operation during the Trans-Continental tests and the Bureau of Standards fading tests.

9HT reports that during the past month many new stations have opened in his district. Mr. Anderson of 9EW deserves great credit for his traffic handling and will work alternate to 9HT. Two new stations are reported handling traffic, 9AJS and 9ALO, the former of Oakland and the latter of Blair, Nebraska. Mr. O'Rourke reports a great deal of malicious QRM in his section and also the use of unauthorized calls. Fading is still prevalent, especially from Kansas stations. Stations further south, such as 5ZU and 5ZP, show very little fading in Omaha. Mr. P. A. Stover of 9JA reports the following changes: 9AWX is helping 9MS in the Davenport section, 9AMU has been added at Marshalltown, 9YI has been added in the Des Moines section, 9AEQ is doing splendid work in handling traffic. Mr. Stover also reports that if 2RK is the sleepless Easterner he thinks that 9JN has the title for the West. Mr. T. E. Brune, 419 N. Clinton St., Iowa City, Iowa, has been appointed second-assistant to the District Superintendent. 9IF of Giltner reports four new DX stations in Hastings and one in Kearney, Nebraska. Turner of 9DU deserves credit for his splendid work in getting new station operators interested in our A.R.R.L. Mr. Turner reports that due to working conditions he cannot handle traffic until 2:00 A.M., after which his station is open for any western traffic. Mr. Otto S. McDaniel of Sedalia, Mo., has been appointed second assistant to Mr. Turner. Mr. J. B. Abercrombie of 1825 Frederick Ave., St. Joseph, Mo., has been appointed city manager. Mr. Abercrombie is executive officer in the Northwest Missouri Radio Association. 9LR of Anthony, Kansas is at present one of the main linking stations between the east and west coast and this station deserves great credit for the number of messages handled during the past month. H. L. Owens of 9EL reports that Mr. O. A. Kimball, his assistant, is suffering from broken ribs and Mr. Ira Graham of Eldorado, Kansas, has been appointed as second assistant District Superintendent, and Mr. Paul Willis of 9OE Wichita, Kansas, has been appointed city manager of Wichita. These men have made exceptionally good records. 9AEG second assistant, reports a new station at Eldorado Kansas, 9AEQ is handling a great deal of traffic. He also reports the organization of the Y.M.C.A. Eldorado Club which has a membership 100% A.R.R.L. The Division Manager requests that all District Superintendents kindly mail in monthly reports before the 25th of each month. Total messages 2127.

Do **You** Belong to the A.R.R.L.?

Your sole requirement is a bona-fide interest in Amateur Radio.

Write to the Secretary at Hartford, Conn.

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6ZK, SUNNYVALE, CALIF.

THE photograph on our cover this month is of a station of more than ordinary interest — that of the genial Mr. A. E. Bessey, our well-liked and extremely successful Pacific Division Manager. 6ZK is the result of over ten years experimenting, and now is as business-like a relay station as one could wish for. It embodies several principles which we think very desirable in a good relay station—whipping the transmitter into shape and then putting it out of the way, with the controls disposed handily, and nothing on the operating table but the receiving set, the key, and a control button, These things make for efficiency in handling traffic, and we know our readers agree us in the feeling that 6ZK is a peach.

The entire equipment of this station was designed and built by The Radio Shop, San Jose, Cal. The transmitter is panel type, with the component parts mounted in the rear and all controls on front, mounted on the wall over the operating table so that the actual transmitting apparatus is located in the next room. The controls provide for instant change-over between the two wave lengths commonly used, 200 and 375 meters, and also for the use of 300 and 600 meters as required by special licenses. Front control of coupling is provided, also a four step variation of power. The transformer is 1 k.w., used with mica condensers and a 12-point rotary gap running 3450 r.p.m. Thermo-couple ammeters are used in the transformer primary circuit and in the antenna circuit. The antenna current on 200 meters is 7.5 amperes, and 8.5 amperes on 375 meters.

A steel mast 95 feet high supports three antennae. One consists of 11 wires 120 feet long on a 20-ft. spreader, running almost vertically, which is used for the 375 meter wave. A smaller T type gives the necessary period for the 200 meter wave without a series condenser. A long two-wire aerial, at right angles to and isolated from the transmitting aerials, is used for receiving, and makes possible a very satisfactory break-in system. No aerial switch is necessary when separate aerials are used, and the two being at right angles, the energy picked up on the receiving aerial when transmitting is not bothersome.

The receiver is in four units of similar construction and is as pretty a job as we have ever seen. The first unit is an antenna series variable condenser and the second is a short wave regenerative tuner of the usual variometer type. On the extreme right is a detector and two-stage audion amplifier, while the long cabinet in the center contains an Armstrong super-heterodyne circuit with radio-frequency amplification. The first tube is the initial detector, the second is the heterodyne, and the next six are the r.f. amplifiers, resistance-coupled. A plug and jack system is arranged whereby the bank of r f. amplifiers can be cut out when local and semi-long-distance signals are to be received.

Mr. Bessey confesses to the modest ambition of some day working 1AW. If only he'd put in a C W. transmitter—!

Since the above was written we learn that on Jan. 15th. at 5:05 a. m., E. S. T., 6ZK was heard while calling 9ZN by both 8ZY, Defiance, Ohio and 2TT, New York City; and that on Feb. 17th. he was again heard by Mr. H. D. Selvage in Irvington, N. J.

So his dream of getting thru to the Atlantic is not an idle one!

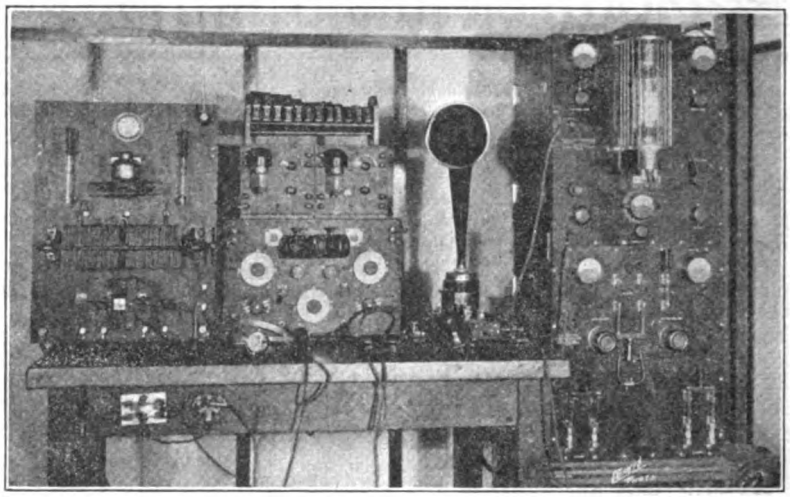
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9BY, ROCK ISLAND, ILLS.

9BY, the amateur station of the Karlowa Radio Corpn. at Rock Island, Ill., is doing good work on its evening schedule of 7 to 10 p.m. and promises to be of help in overcoming the difficulties of transmission which have long existed between Chicago and the Tri-Cities.

as amateurs within range have supplied them with a slogan: "When 9BY is called, it answers". A lot of the secret is in the tube equipment, hard bulbs being used so that very little fussing is necessary and the operator can give his attention to tuning.

9BY gives a phone concert every Thurs-

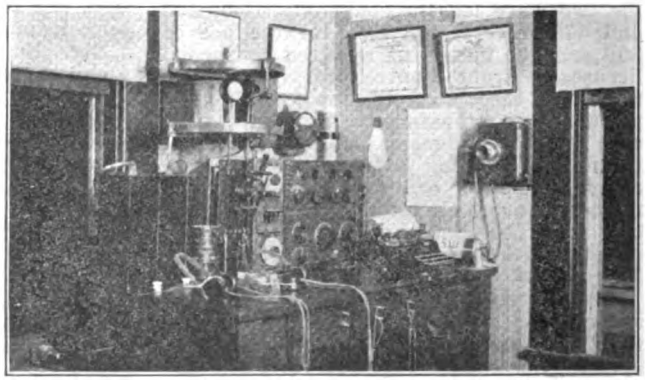


9BY is equipped with a ½ k.w. DeForest Oscillion transmitter and a 1 k.w. spark set, making available for instant use by means of the proper control, C.W., I.C.W., phone, synchronous rotary spark, and 120 cycle quenched spark. Honeycomb coils exclusively are used in receiving, for short as well as long waves, as they have found tickler regeneration more reliable and stable for their work, and they work there,

day evening between 8 and 9 o'clock which is regularly heard over 300 miles radius, and the voice and I C.W. signals regularly covers up to 900 miles. The antenna current on 200 meters, C.W., is 3 amperes; on voice, 2½ amps. They would be pleased to hear from amateurs who pick up their signals and want their criticisms as well as their compliments.

5ZX, HOUSTON, TEX.

We've had photographs of a number of Houston stations lately but there is always room for one more, especially an outfit as clean-cut and business like as 5ZX, ex 5AO, owned by Mr. A. P. Daniel, president of the Houston Radio Club and A.R.R.L. Assistant District Superintendent. Mr. Daniel's earlier station was shown some months ago in QST, and the comparison will show his progress in this game of ours wherein there is no such thing as standing still.



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The transmitter has a 1 k.w. Thor and a Thor O.T., home-made condenser, and home-made semi-quenched rotary gap; the receiver, a Grebe CR2, home-made detector-and-two-step, and Baldwin phones. The antenna is a 4-wire inverted L supported by a 62 ft. mast made of tin gutter pipe after the style made famous in 1916 by S. Kruse.

5ZX's transmitting records (mostly under the old call 5AO) include New York City (three times) 1435 miles; Douglas, Ariz.; Denver, 875 miles; Ellendale, N. D., 1125 miles; St. Paul, Chicago, Detroit, Cleveland, Washington, Philadelphia, etc. The receiving record is 6CO at San Jose, Cal., 1600 miles.

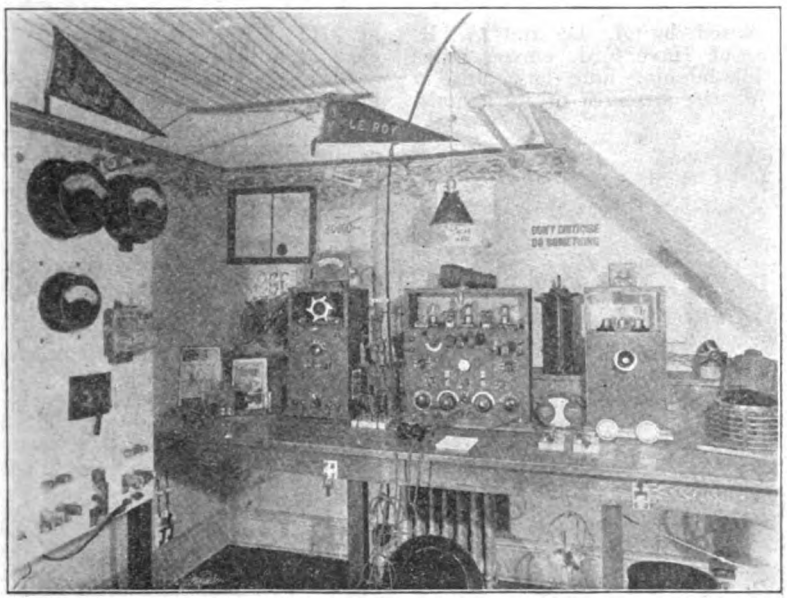
CANADIAN 3GE, TORONTO

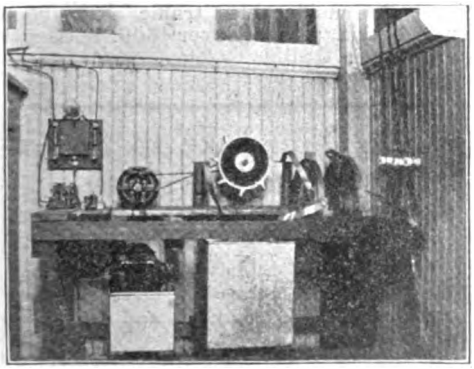
This photograph is of the one of the Dominion stations, operated by Mr. G. W. McClain, Toronto.

The aerial is an inverted L 40 ft. high and 75 ft. long, with a counterpoise of similar length under the aerial and 2 ft. above ground. A single 300-ft. wire gives better receiving results, however. (We wonder if the miniature aerial on the upper-left ceiling is what those Canadian 50-meter aerials look like. We never saw one.)

Mr. McClain's transmitting panel, in addition to the meters, holds a half-k.w. transformer, with primary taps to a switch on the panel to vary power, while the balance of the apparatus is on the table and comprises a Signal glass-plate condenser, variable by a fan switch, a saw-

(Concluded on next page.)





8VJ, FINDLAY, OHIO

Mr. Edwin W. Tarbox sends us this photo of his station, 8VJ. Distant control is used, the receiving room being about twenty feet from the transmitter, and no view of the operating room is available. The transmitter has an oil-immersed Thor, an oil-immersed condenser, a belt-driven Hyrad gap, and pancake O.T. 8VJ puts out about 7 amperes with 5-inch coupling, but we don't know on what kind of a meter. The relays for distant control are seen on the extreme left of the table, with the kick-back preventor on the wall above.

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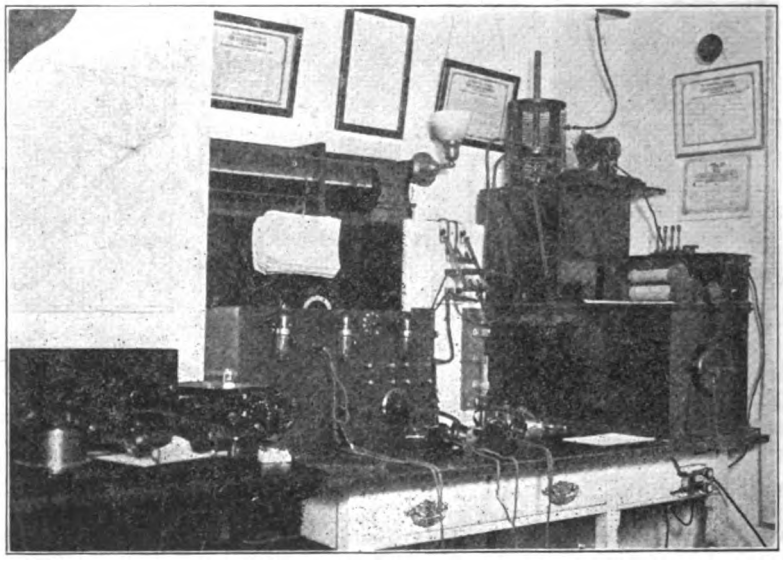
tooth gap, and a hinged pancake O.T. with 4-inch ribbon on the primary and 2-inch on the secondary. (United States amateurs please note.) Having just recently got connected up, 3GE has as yet worked no great distance, but has been heard OK in Bridgeburg. He would like to try Buffalo amateurs any day between 12:30 and 1:15 p.m.

The receiving unit employs honeycomb coils for tuning, an Electron Relay detector, and Marconi Class II tubes for amplifying. His cabinet is certainly a neat and business-like job. A large number of American amateurs are copied, in the 1st, 2d, 3d, 8th and 9th districts.

Mr. McClain promises us more later about the mysterious cabinet on the right, which seems to be a radiophone. By the way, note his interesting style of construction, as employed in the phone, the tuner, and the gap unit, of building a cabinet having a panel for part of the way and a kind of shelf at the top for placing parts that have to be got to or watched.

3HJ, HAVERFORD, PA.

3HJ is owned by A. D. and A. H. McNaughton, of Haverford, eleven miles west of Philadelphia, and has quite a reputation for the strength of its signals.



The antenna is a fan of four wires 80 ft. high, with a 60-foot span at the top, which is to say that the spacing between wires is 20 ft. at the top, while the ground is to buried wires and the water system. The transmitter is the product of F. B. Chambers & Co. and consists of a 1 K.W. open-core transformer, glass-plate oil immersed condenser, a 6-tooth rotary running 8000 r.p.m., and a squirrel-cage O.T. of which 2⅝ turns are used in the primary and 6¾ turns in the secondary. The antenna current is 3.3 amps. The receiver is home-made and consists of a variometer regenerator, detector and two-step. The RA-6 Paragon shown at the extreme left belongs to Division Manager Chas. H. Stewart, 3ZS, and was installed at 3HJ during the Transcons for use in case of a break-down.

3HJ has carried on actual work over a distance of 1400 miles, and has also worked 9EL, Council Grove, Kan., 1150 miles. Considerable traffic has been handled this season, over 300 messages having been QSR'd.

Would You Like to See a Photo of Your Station in QST?

We'd be glad to have it there, O. M. Send us in some good, clean photographs and a description, and we'll do the rest.

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Second District Show & Convention

Are you all set? Are you accumulating the filthy lucre to take you to little ol' New York and back? You must, because on March 16, 17, 18 and 19 there will be held at the Pennsylvania Hotel the First Annual Radio Convention and Exhibit of the Second District, and it's going to be a real affair. The large Pennsylvania Roof has been secured for the exhibit, and all the manufacturers of prominence will have booths in which their apparatus will be displayed and explained and orders taken. The best apparatus in the country will be there for you to see, connected up in actual operation on aerials, and if there is anything you need you could never have a better chance to make an intelligent selection. Adjoining the Roof is the beautiful Butterfly Room, accomodating an audience of about 500, where on each of the first three nights there will be technical meetings, starting with an hour's lecture on vital amateur technical problems by prominent men, and followed by a series of 20-minute talks by the various exhibitors On the last night, Saturday the 19th, there will be a big banquet in the Main Ballroom of the hotel at 6:30, with dancing afterwards. This banquet is for the ladies as well as for the men, and everybody directly or indirectly interested in radio is invited to attend.

The affair is being managed by the Executive Radio Council of the Second District. This council is composed of representatives from most of the Second District clubs, and while neither the council nor the show is officially an A.R.R.L. affair, we all know that good amateurs cannot meet without being pretty solidly A.R.R.L. men. This thing deserves your hearty support, fellows, and we want to see you there. An admission fee of 25 cents will admit any radio man to the exhibits and lecture room for the entire four days. Tickets for the banquet are $3 00, and applications can be sent to F. C. W. Thiede, Cor. Secy., 486 Decatur St., Brooklyn, N. Y. The accomodations are limited to 500, and as this is going to be a big meeting, you had better get yours in at once.

There has never been such an opportunity for advancing Amateur Radio in this section of the country before. The A.R.R.L. has secured Booth No. 21 and the Traffic Manager will keep A.R.R.L. Open House there during the show. You are invited to drop around and get acquainted and unburden yourselves on anything pertaining to Second District affairs.

Chicago Executive Council

The little "Grid Leak", the stenciled organ of the Chicago Executive Council, is now a full sized printed magazine known as "Radio Topics". The first issue is full of the pep of the Chicago boys, and it will improve and grow every month we know. It should be understood that the Chicago Executive Council is composed of the clubs in Chicago and vicinity that are affiliated with the A.R.R.L. and as its mouthpiece the policies of "Radio Topics" are those of the A.R.R.L. Its interest is in the continual improvement of amateur relay conditions in the territory under the jurisdiction of the Chicago council, but in its articles, etc. "Radio Topics" will be of national interest. QST greets a helper, and wishes it every success.

Radio Club of Tacoma

The Radio Club of Tacoma (Washington) extends a cordial invitation to all amateurs to attend their Second Annual Banquet in the Knights of Pythias Hall, Tacoma, Wash., Saturday, March 19th. Amateur Radio is booming in the Northwestern Division and this will be a real get-together meeting of all the radio men in that corner of the country. If we could only get out there from Hartford at the speed at which our Transcons move we'd be there too. Amateurs who can make the ripple better than we are requested to notify Al Stenso, 1921 So. Jay St., Tacoma, of their intention to attend, so that full provisions may be made for their comfort and convenience.

Detroit Radio Assn.

The "Detroit Radio News" for Jan. 31 contains the new traffic regulations adopted for Detroit and vicinity and approved by Radio Inspector Edwards. The basis of the plan is a division of working hours on the so-called Chicago Plan: All testing to be done before 6 p.m.; 6 to 10 p.m. local work; 10 to 11 p.m., testing for DX range under permit from the club's

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Traffic Committee; after 11 p.m. relay traffic by certified DX stations.

The D R.N. is a live little sheet, and in addition the club is running a radio column each Sunday in the "Detroit News", with fine publicity for Citizen Radio.

The club makes use of a new Q signal, QRR, meaning "Stop local conversation", for piping down QRM after 10 p.m.

The Twin Cities

By considerable odds the best local sheet we have yet seen is "Kick Backs", published monthly by the Executive Radio Council of the Twin Cities (Minneapolis and St. Paul) and the Dakota Division. Boyd Phelps, Division Manager, is its Editor, with H. R. Hall, Supt. of Southern Minnesota, as his assistant. QST offers its hearty congratulations. It's the kind of a paper we love to read—just chuck full of the real spirit of Amateur Radio, and if the birds out that way appreciate it half as much as we do the copy that percolates into GHQ, it will never stop. Its existence, the editors point out, depends on the co-operation the local men display in sending in ideas and contributions, but if the whole Dakota Division hasn't leaped into action to support the movement, we miss our guess. Congratulations, OM Phelps, and keep us on your mailing list. The price of a subscription until summer is 30 cents, which should be sent to R. K. Viles, secretary of the council, at 416 Court House, Minneapolis.

Radio Association of Western New York.

The first meeting of the year was held Saturday, January 8th, when the installation of officers took place. Lunch was served after the meeting and a number of invited amateurs signed applications for membership.

With the beginning of the year, a notable benefit from our organization has resulted in considerable traffic being handled. Our Traffic Chief, Mr. A. H. Benzee, Jr., (8FE) has announced his pleasure at the co-operation of all amateurs, especially on A.R.R.L. fading tests.

The following traffic rules became effective on Nov. 1, 1920:

6:00 A.M. to 7:00 P.M.—Free air.

7:00 P.M. to 9:45 P.M. Local traffic only. No testing or tuning permitted during this period.

9:45 P.M. to 10:15 P.M. No transmission of any kind.

10:15 P.M. to 6:00 A.M. Long distance traffic only.

Successful communication is now established with Canadian stations through 3BP of Toronto.

Mr. F. Clifford Estey of the Amrad Sales Force paid us a visit recently and recounted some of his experiences on organization to reduce QRM.

The Radio Association of Western New York sends fraternal greetings to all radio organizations throughout the world.

Address all communications to Elmer H. Kumpf, Sec'y, 41 Amsterdam Ave., Buffalo, N. Y.

Nola Radio Club

A decided increase in amateur radio activity is manifested by the increasing attendance at the meetings of the Nola Radio Club. Not one meeting has passed but what new members were enrolled and we look forward to the time when all amateurs in this vicinity will be part of our organization. C-W transmission is coming into its own down here, one station already operating and two more in the course of erection, with promises of other stations following. At the last meeting of the Club an election for officers resulted in the re-election of the old officers, viz; G. A. DeCortin, Pres.; Chas. Johansen, Vice-Pres.; and C. J. Delaplaine, Secretary-Treasurer. Mr. DeCortin had just returned from a trip up north and had much interesting and valuable information on matters concerning amateur activity in the First and Eighth District. His lectures and enthusiasm are great factors in the success of the Club and all members show a splendid spirit of co-operation. He is ably assisted by the other officers and with all members pulling strong the Club cannot help but progress rapidly, continuing in its good work and promoting good-will and fraternity among the operators and experimenters here.

Radio Research Association

The Radio Research Association has been formed by the former members of the Scientific Research Club, a pre-war organization.

The club has installed a regenerative receiver with a two stage amplifier for temporary use. A short and long wave receiver, a spark transmitter and a C.W. set will be constructed in the near future by members of the organization.

The technical committee of the Radio Research Association is composed of experienced radio men.

We are forming a junior class for amateurs who are not of age yet to enter the senior organization. Instruction will be given in both code and theory. It is the purpose of the club to experiment in the field of radio and it will be beneficial to all interested in radio to communicate with us. We are affiliated with the A.R.R.L. and expect to take an active part in the relay work of that organization.

Meetings are held every Saturday at 8 P.M. at 258 Henry St., New York. The club rooms are located at 8 Pitt St., New York.

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Communications should be addressed to the secretary at 8 Pitt St., New York, N. Y., or 233 South 3rd St., Brooklyn, N. Y.

Tri-County Radio Club

The amateurs of Richmond, Virginia, met at the John Marshall High School January 17th, 1921, and formed the Tri-County Radio Club. There were forty men present, and Mr. C. D. Blair, A.R.R.L. Supt. Central Virginia was elected Advisory Chairman, Mr. George C. Robinson elected Permanent Secretary, and Mr. Orris M. Selph Acting Chairman. Meetings the first Monday in every month, Room 207 John Marshall High School, Richmond, Va. at 8 P.M. A schedule regulating transmitting and receiving was adopted providing free air 6 A.M. to 5 P.M.; 5 P.M. to 6 P.M. standby for U.S. Bureau Market report; 6 P.M. to 8 P.M. local traffic; 8 P.M. to 9:30 P.M. standby for radiofone music and concerts from local and long distance radiophone sets; 9:30 P.M. to 6 A.M. solely for relay work. This was approved by all the members present and the schedule is in effect immediately. All correspondence is handled by the Secretary, Mr. G. C. Robinson, 657 North 8th, Richmond, Va.

Dallas Radio Club

5AJ has a newly acquired "OW"! District Superintendent Harold P. Heafer and Miss Jessie Wheeler of Dallas were married in that city on Jan 17th, and we are sure the tribe wishes them a happy and prosperous married life Mr. Heafer, besides being D S., is chairman of two committees and a member of the Board of Direction of the Dallas Radio Club, likewise a born key-pounder, so no doubt he will have his hands full for a while, with all kinds of "reports" to make.

He has done some excellent work in our club and its organization, being one of the charter members. He has always upheld its integrity and being fair minded, has helped to keep down those little dissensions and squabbles that don't seem so much at the time but if allowed to continue will in time cause a club to disintegrate until its members drop out thru lack of interest, hard feelings, etc., and it becomes a club in name only. Long may he radiate.

Jefferson City Radio Club

At a recent meeting The Jefferson City Radio Club reorganized and drew up a new constitution. The following officers were elected:

President Harold Engelbrecht
Vice President and Treasurer Sam Blair
Secretary Bethel Brace

A committee was appointed to give talks or a debate once every month and to make the meetings interesting to all who attend.

There are ten members in the Club, all of whom own and operate sets and are doing fine work. Special recognition is given those in the Club who operate licensed stations, thus encouraging the fellows to get licenses. The Club meets every Friday night and affords instruction as well as some wholesome fun. Correspondence from other clubs or individuals is urged. Please address all communications to the Secretary, 403 E. Ashley St., Jefferson City, Mo.

THE STORY OF THE TRANSCONS

(Concluded from page 12.)

ing at 1AW, there would be a few minutes of dead silence after 9ZN had relayed a message west; then, as we camped on his tune, there would come a solitary "r" which would be the unmistakable sign that he had copied the reply from 5ZA and which was confirmed as he instantly called 1AW and repeated it at a speed which made us scramble to get it on paper, and another message had made its round trip. That was the handling that every message got on the eastern end.

Countless new receiving records were set up during these tests, a number of 6's being copied in Ohio and vice-versa. In this issue, for the first time in A.R.R.L. history as far as we recollect, we have lists of "Calls Heard" reporting stations from EVERY DISTRICT! 9CA and 9GC report that on one night there was a time when they could hear 1AW and 6JD transmitting at the same time—both coasts.

We plan to make the Transcons an annual affair—an A.R.R.L. speed classic. The reduction in the record from 1:20 to 0:6:30 is so great that it will take a good line-up and good conditions to improve upon it. Just what can we hope to do? We don't know what the good stations will be a year hence (and it will be interesting to see how they change) but we can reasonably hope that we will have progressed by then to the point where just one intermediate relay, midway across the country, will suffice. Perhaps C.W. will be the solution. Then if we can get an exceedingly brief message, of just two or three words, permitting an answer just as brief, and can handle it at high speed without calling and without QTA's, we seem to have a possible figure of 1½ minutes for the round trip. That would be about the ultimate record, for if the intermediate station were eliminated it would no longer be a relay. However, 1½ minutes is so much less than 6½ minutes that we believe that even that splendid record is likely to fall when the next Transcons roll around.

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The A.R.R.L. hasn't a complete list of its members who served in radio during the recent emergency. Accordingly we want to ask that every ex-service man send us his name, address, outfit, rank, and nature of duty. A postal will do.

Have you been hearing Catalina? Really? If you're near Los Angeles, OK, but if you live near New York, ND. We have had many letters on this subject and wish to explain that the voice is Catalina's all right but that the radio emission heard in the east is from an eastern station and not direct from the west coast. The AT&T and Western Electric are carrying out some experiments whereby the Catalina Island radiophone, at Avalon, 30 miles out from Los Angeles, ommunicates to mainland via radiophone, where the speech is fed into the transcontinental land line of the telephone company and conveyed overland to the east coast to a radiophone station, which in turn communicates by radio to the "floating laboratories" of the Western Electric Co., KQO and KQG. San Francisco, Salt Lake City, Harrisburg, Pa., and other inland points have been heard—but they are merely cutting in on the transcontinental circuit. So no wonder an amateur in Maine gets excited when he hears a voice say "This is Los Angeles"!

From the New York Globe we learn that Herbert Hoover was to send a message to the people of America via amateur radio, and that the amateur **radiographers** of the American Radio **Relief** League were going to **watch** for it. Quick, orderly, make ready the pneumatic chamber!

NSF, at the Naval Air Station, Anacostia, D C., broadcasts a bulletin of technical radio information by radiophone on 350 meters at 9 p.m. E S.T. and again at 10 p.m., every Friday night. We have heard the first two weeks' transmissions, describing the equipment at NSF and its operation, and if NSF is within your receiving range it is well worth your while to tune in to these broadcasts. You will find the information interesting and valuable.

Aviator Harry D. Copland of Boston, late of the R.A.F. and formerly a Boston amateur and ship-mate-operator of Division Manager Entwistle, has arrived in Florida via airplane from Portland, Me. Arrangements were made by our Operating Department whereby a local amateur met him at scheduled stops with information on landing fields at the next stop, which information was obtained by radio from the next point south. The ship had no radio equipment, but Amateur Radio showed it could help. Blair, 3ZL, had him in tow during his stay in Richmond.

We neglected to state in the February issue that the list of calls reported by 9FD on page 69 was heard on a wire clothes-line five feet above the ground. Good work.

Mr. R. C. Denny, 6CS, sends us a description of his station which uses an indoor aerial 15 feet above the ground and consisting of six No. 18 wires, 3 ft. apart, 40 ft. long, stretched between porcelain cleats in his attic. Such an aerial having not near the requisite natural period for 200-meter transmission, large inductance coils containing 40 feet of the same wire are added at the free end of each antenna wire, to boost it. With 3 amperes in this aerial on 620 watts input, 6CS is reported QSA at 250 miles, and receives amateur signals up to 1000 miles. This idea will be helpful to those who use indoor aerials, and Mr. Denny is to be congratulated on his ingenuity and good work.

Mr. Denny is an engineer for the San Joaquin Light & Power Co. of Fresno, which has a hydraulic development under way in Kern River canyon, 125 miles south, in a very inaccesible location. It is only natural, therefore, that we should read that his company has installed radio to keep headquarters in touch with the project. Spark equipment is used, operating at 425 meters on limited commercial license, with call letters KDNU for Fresno and KDNT for Kern Canon.

4XB suggests that T.O.M. ought to be appointed Grand Bum Operator of the I Tappa Key fraternity.

NOTICE—On page 33 of January QST, regulations for handling traffic with Canadian stations were announced, and called for the intermediate signal — — —. when a Canadian station called and worked a U S. station. This signal is not so greatly different from the customary "de"

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when ground out with the proper amount of Lake Erie swing, as unfortunately obtains in some places, so that confusion is resulting and the Canadians are not always recognized. The official intermediate signal for this work is therefore here announced as changed to ..—.—— ("fm"). Canadians will please note and be so governed.

U.S. stations should make more effort to connect with Canadians. Canadian 3BP, Toronto, is now doing excellent work and many of you will be surprised to learn it was a Canadian that you worked. If you have 3BP down it was he, as U.S. 3BP is idle at present.

Lots of spark apparatus being advertised for sale in our classified ads. Is CW wiping off the damped wave? (Echo from 9ZN: "NO!")

Looking for a Canadian connection? 3Z, E. W. Farmer, Farnham, Que. advises he is on watch every Saturday night from 10 to 12, wave 265 meters, and wants the traffic. QSA occasionally at 1AW.

Some newspaper articles on radio are really funny. 8KS sends us a Rochester clipping describing a station to be installed in a high school there. We are told that "with the exception of what, in compliance with the law, must be done by the fire marshal's men, the work of installation is being done by the boys themselves." Can one, in accordance with law, call upon the local fire eaters to help erect an antenna? Or, as 8KS suggests, maybe they're installing a fire box to use as an omnigraph.

"Geo. T. Hart, director of the club, said last evening that he believed the outfit was sufficiently strong to send messages to any part of the world, but that in compliance with the laws of this country foreign messages would not be sent. However, there will be exciting enough practice for the young operators in telegraphing to Chicago and other points in the United States.

"The station is nearly completed. This is a room.... entirely enclosed in glass that the waves within may not be in the least disturbed by any outside."

Get out the old galena, gang, and dust 'er off, for when this outfit opens up our bulbs will be knocked for an eight day flip.

A radio note book is a valuable thing for the amateur. In it may be placed any notes pertaining to care and operation of radio apparatus; any clippings taken from journals; formulae and tables for calculations; hook-ups; sketches of apparatus—in short, any material which might be of value to the station owner at present or at some future time.

Regarding tables: amateurs fail to realize how valuable it is to calculate inductance, capacity and wave length accurately. To do it requires in most cases the use of prepared tables and a knowledge of arithmetic. How much more efficient is an inductance with taps at the proper calculated places than one with taps at any place, regardless of necessity! Let's be more precise in our measurements.—Carlos S. Mundt.

Mr. Arthur W. S. Davis, 1LD, aged 71 years, pioneer member of the Lowell Radio Club, passed out in Lowell, Mass., on Jan. 25th. The Lowell club deeply mourns its loss—a loss that is amateur radio's in general. Mr. Davis was well known to the old timers, as he had been in the game from the start and had the distinction of having assisted Mr. Marconi in an exhibition of his then new invention in Lowell in 1903. Several of his patents are embodied in present day telephones, to which work he gave many of his active years. During his last illness when confined to his bed he had his set transferred to his room so that he practically passed away "with the receivers on". Isn't that devotion to the game?

"Many amateurs rendered good service with our troops on European battlefields, some whole wireless companies of the Signal Corps being composed almost exclusively of licensed amateurs. During the past year 5,988 amateur operators were licensed. From many points of view, the development of amateur interest in radio communication should be encouraged in the interest of the nation. The Bureau of Navigation hopes to be able to give to amateur apparatus and operators such attention as the staff and means available will permit."—From the Report of the Secretary of Commerce, 1920.

WOULDN'T IT BE WONDERFUL—

If 3DH would get down to 200 meters where a general amateur station belongs?

If the fellow that borrows our QST wouldn't give it to the baby to play with?

If 1XX sent radiograms instead of night letters?

If 3PU would listen more and CQ less, and would stop gumming up 600 meters?

If 8..——Q would tell us what letter ..—— is?

If there were a cure for "side-swiperitis"?

If 9ZN would hear 7DA at the same time 7DA hears 9ZN? (Wow!)

If there weren't so much wire in wireless?

If 200 meters were as long as a lot of amateurs seem to think?

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If 8FI would stop worrying about his lost ¼ amp. radiation?

If you could only hear the guys that mail you cards saying that you. are QSA?

If the Chief Opr. at 8XU (or the R.I.) would hitch one end of a rope to the secondary of 8XU's O.T. and the other end to a street car, and then run the car to the end of the line? (Yes, if the car line ran **away** from the primary.)

If regenerative sets sold for $5.89!

If 7BA would leave out about half of his "OM's"?

If we could QRT NAM?

If we could find out what 8ZL's wave is?

If all radio inspectors were like Charles Kolster?

If Hewitt went to sleep on watch? (Hi!)

If 9LR would sell his coherer and buy a receiving set?

If 3IW got an answer from this guy CQ?

If 7HA and 9HK would learn the code?

If XB1 got an answer from XF1 in less than ten long calls?—or if he learned to make an X or a B?—yes, or if he made a **short** call?

Daily Radio Marketgrams.

Daily market reports are being transmitted by radio each week-day at 5:00 p.m., Eastern Time, at 400 meters from WWV, the Bureau of Standards station, Washington, D.C. These market reports are prepared by the Bureau of Markets, Department of Agriculture, for the information of farmers, cattlemen, and truck gardeners, and are sent QST with the intention that they will be copied by radio operators and transmitted to local papers for publication on the same evening. It is also desirable to post the information in post offices and other public buildings.

The sending of reports from WWV is an experiment which, if it proves satisfactory, will form the basis of a system of market report stations. In order that complete information may be secured as rapidly as possible, operators are asked to write the radio laboratory of the Bureau of Standards as to what success they have in receiving the reports, noting especially if there is any difficulty with fading, and if signals are of sufficient intensity so that it will be possible to receive them through summer atmospherics.

As the reports contain a number of price quotations, given in dollars and cents and fractions thereof, the following standard method of sending fractions has been adopted:

$1.50 is sent as 1R50
$1.50½ is sent as 1R50 AND 1 DN 2
⅞ of 1 cent is sent as 7 DN 8 CENTS
65⅞ cents is sent as 65 AND 7 DN 8 CENTS

The names of the cities most frequently mentioned in the reports are abbreviated as follows:

New York—NY, Baltimore—BALTO, Washington — WASH, Philadelphia—PHILA, Kansas City—KC, Chicago—CHGO.

If other abbreviations are required, their forms will be as readily understood as these.

During each period of transmission, 3-minute waits are introduced at 15-minute intervals.

There seems to be much confusion between stations NSF and WWV.

NSF is the station of the radio laboratory of the Naval Air Station, Anacostia, D.C. It is located at the confluence of the Anacostia and Potomac rivers. The laboratory is under the direction of Commander A. Hoyt Taylor. NSF is equipped with a high-power short-wave tube set, described in September 1920 QST. The set is used for I.C.W. and C.W. telephonic transmission.

WWV is the station of the radio laboratory of the Bureau of Standards, Department of Commerce. It is located at the Bureau of Standards, Connecticut Avenue and Pierce Mill Road, about six miles northwest of NSF. There are at present two transmitting sets in use, a 60-cycle 1-kilowatt set operating at 210 meters, and a 500-cycle 2-kilowatt non-synchronous set operating at 400 meters. The latter set is used until March 1, 1921, to send daily radio marketgrams each week-day, beginning at 5 p.m. Eastern Time.

They tell us 3DH has two sets and changes from one to the other at the ringing of a little electric bell whenever the rotary gap on the set in operation gets red hot. One set would hardly stand up the way 3DH keeps on the air.

9AIF reports copying 9LR and 5IS while listening on 5500 for XDA. Hi! Next time you fellows get QRM on 200 meters while after 9LR, plug in some L-450's and work right thru squeak boxes 'n' everythin'.

This actually happened at NAH:

O. I. C.: "Jones, do you know anything about Litzendraht?"

Super: "Dunno, sir, he ain't on my watch".

From one of our contemps: "The amateur fraternity can rest assured that whenever real (legislative) danger threatens, they will be advised quickly and effectively."

Yes—by the American Radio Relay League.

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RE THE H. C. R.

Atlantic Radio Co.,
88 Broad St., Boston.
January 6, 1921.

Editor, QST:—

I notice on page 59 of your January issue a letter signed by Mr. Heydon and Mr. C. W. Thiede in which they claim that drastic price reductions should be made in radio supplies and also stating as fact that certain concerns in the radio business are making 300 per cent. profit.

They invite expression of opinion from buyers and sellers. As an officer in a wholesale and retail sales house I take pleasure in expressing to them and to other readers the following facts:

First, that the statement of the 300 per cent. profit is false and cannot be proved. There is no reliable radio concern either making or demanding any such profit.

Secondly, that the above profit is an impossibility under the conditions which exist in the radio field today.

Three, drastic price reductions are impossible although in certain cases reductions could be made and should be made. Mr. Heydon and Mr. Thiede have argued from a point of view which seems, at best, childish and unsound. They failed totally to realize the following facts:

A—The acute conditions existing today from the various radio patents necessitating the paying of royalties to a certain few large corporations.

B—The fact that the turning over of stock in the wireless game is comparatively slow and hence—a high overhead charge results.

C—The fact that only experienced and highly trained workmen can construct and assemble really efficient apparatus and that these men of necessity draw large wages.

D—The fact that the whole science of wireless is progressing extremely rapidly and in order to have this state of affairs existent a tremendous amount of laboratory research work by highly paid technical experts is essential.

There is not one of us actively engaged in the radio business who does not desire to place before our customers good apparatus at the lowest possible figure but the above facts considered seem to me to explain the necessity of moderately high prices.

In closing, I wish to request from the gentlemen writing the original letter to make good their assertion that they can readily ascertain and prove the fact that radio concerns are making 300 per cent. Their failure to do so would seem to me to call for an apology through your columns, to all manufacturers and dealers in the radio line for the base slander and libel that they have asserted against those interested in the radio industry.

Very truly yours,
Frank Wigglesworth.

Cambridge, Mass.
January 10, 1921.

Editor, QST:—

On reading the communication, "The Price of Equipment," page 59 in the January issue of QST, our first thought was to refrain from giving this sort of Bolshevism serious consideration, but on second thought, from fear that at least a wrong impression might be created, we have decided to reply and state the facts from a legitimate manufacturers' point of view.

Let us first consider the 300 per cent. profit which these joint authors feel is being made by many radio concerns. Take a $20.00 article which is sold to dealers at varying discounts according to the quantity. Suppose this amount is $16.00 which our esteemed contemporaries say contains 300 per cent. profit which is $12.00 leaving $4.00. Now this $4.00 must cover the following expenses:

Raw Material.
Direct Labor.
Overhead Expenses.

The Overhead consists of: Rent, Advertising, Office Salaries, Supervision, Office Expense, Factory Expense, Shipping Expense, Development Expense, Depreciation and many smaller Expenses whose totals cannot be neglected.

As a matter of fact that $4.00 would not nearly cover the raw material on a $20.00 article. It might cover the direct labor, but would hardly cast a shadow on the Overhead Expense. Reductio ad absurdum.

These gentlemen figured the profit on a slide rule and have not yet fixed the decimal point. We know because we have just completed our fiscal year, and also

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completed those myriad of records and figures required from all corporations.

We would also call your attention to page 67 of the January QST under Strays, which states, "Wouldn't it be wonderful—if QST wouldn't print such rubbish as this?" and ask if this should not be put on page 59 under the article "Price of Equipment."

Very truly yours,
Acme Apparatus Co.
per C. F. Cairns.

(Now that both sides have had space in QST we feel that we must print nothing more on the subject. Our space is too limited and valuable—it's needed for other topics.—Ed.)

G.B. CALLS HEARD AT SEA

Division of Operations,
United States Shipping Board,
Emergency Fleet Corporation,
Washington
February 10, 1921.

Editor, QST:—

My attention has been invited to the fact that in the December and January numbers of your magazine, you printed articles showing work which has been carried on between Shipping Board ships and amateur stations, and in particular on page 32 of your December number, you printed an appeal to the commercial operators to supply you with information concerning the reception of signals from amateur stations.

We are in entire sympathy with the development of amateur radio telegraphy, as a great many of our commercial operators were formerly amateurs, but at the same time we regret very much to see an appeal made to our commercial operators to devote a part of their time on watch to copying amateur stations.

As you know, operators are required to keep watch on 600 meters, and time spent in listening on amateur wave lengths is time lost as far as the commercial operation goes. It is quite possible that some operator might fail to receive an SOS signal due to the fact that he was not listening on 600 meters.

We have also noted that some of our operators have been reported for using their transmitting apparatus on 300 meters to communicate with amateur stations, which not only causes unnecessary interference, but renders the commercial operator liable to cancellation of his license.

We trust you will realize the importance of this matter and will take steps to discountenance work between commercial operators and amateur operators. The number of amateur operators is so great, and they are to be found in such widely separated parts of the United States, that it would seem that the most enthusiastic amateur could test out his range with some other amateur without finding it necessary to call on ship operators for this purpose.

Yours very truly,
L. R. Rutter.
Manager, Operating Department.
By F. P. Guthrie.
Head of Radio Section.

CAGE AERIALS

4903 6th Ave.,
Brooklyn, N. Y.

Editor, QST:—

Referring to the article in the October issue of QST concerning cage aerials, I would like to offer a suggestion in connection with the separator rings. I have been building a cage along the lines described by Mr. Young and have found it to advantage to use copper tubing for the separator rings. I am using ¼" O. D. tubing, which is considerably lighter than the copper rod, cheaper by a big margin because the price is figured according to the weight, and offers the same rigidity and strength as the rod.

If you can find room for this bit of chatter in your magazine, would also like to offer a suggestion to the users of spark coils. I am in a very congested district as far as radio is concerned and there are numerous spark coils at it hot and heavy continually. The most objectionable practice these fellows have is the adjusting of their sparks with the aerial switch thrown on the sending side. Why in the name of Jake these fellows can't omit the aerial part when they are adjusting their sparks is more than I can figure out. It's enough to drive a man to "drink" to sit there and listen to that constant sputtering and spitting of a half dozen spark coils trying to get their sparks clear. If some of the fellows who use spark coils would bear this suggestion in mind it would help to relieve the QRM considerably and also the general feeling that the fellow with the spark coil is a pest.

With best 73's and wishes for the continued success of QST, I am

Yours very truly,
Frank A. Maher, 2RM.

FROM A YOUNG AMATEUR

Alameda, Cal.,
January 18, 1921.

Editor, QST:—

I have just finished setting up my Three Panel De Forest set which I am very much pleased with. I am very proud, as all amateurs are when we get our first set. It is the pride of the neighborhood. All my friends are very much interested—most

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of all their mothers. Talk about curiosity killing the cat, my cat is nearly dead and the dog too, from curiosity.

I have been getting my outfit together for some time, so on the fifteenth of January, it was finished.

On the sixteenth I listened in and Lo and Behold! I heard "All right, boys, in 40 minutes you will hear me talk again." (How romantic) My heart jumped for joy! For I recorded a radio phone message in the first day! Think of it! A little later I heard "All right, try the other coil."

Then at six o'clock I heard a fellow sending when all of a sudden (you have all heard a killdeer wakened from a nap) Bang! That's just what it sounded like only it was very high pitched. Like this Tee! Tee! Tee! Then he would stop and start in again every minute Tee! Tee! I sympathize with The Old Man about fellows chewing up the ether. I would dislike to have been up there then! Gosh!

This first fellow, goodness knows how long he must have been sending before my galena started to work. But anyhow, he kept it up for about an hour.

It sounded like he was giving a dictation. But every now and then the second fellow would start his little piece. It sounded very funny to a ticklish fellow. I will admit I did laugh.

The next night I heard a somebody sending nicely when suddenly somebody who must belong to Art Hickman's Jazz Band —speed and jazz, nobody can compare with him. So this is the end of my little plea to the commercials and amateur operators. I hope we all agree. I thank you for your good attention and here are your ears (or phones) which I loaned from you.

Sincerely,
The Amateur and Stenog.

Words by the Amateur,—Penmanship by Will Ward.

HOOK THIS TO YOUR BULB

Marion, Mass.

Editor. QST:—

You fellows that have been hollerin' grounds, water pipes, wash boilers, bath tubs, gas pipes, etc. Why wouldn't it be a good idea to tune your ground system up a bit, same as you do your antenna? You wouldn't think of putting up seven or eight antennas of different lengths and trying to tune 'em all to one wave length with one O. T., would you? Well, then why do it with your ground system? The current is bound to be absorbed by the connection that comes nearest 200 or whatever your emitted wave is.

If you have seven wash boilers in the ground, get busy and insulate each lead to said wash boilers and insert an inductance in each of the seen leads—time 'em up, each separately, till the highest radiation is obtained—make 'em all equal so that when your ground does take hold it will be with an even wallop on each lead, same as a counterpoise. This will bring a lot of you fellows from the "just-about-hear-'em class" to one of the "husky fellers." Try it.

If you have a ground up in the next block, which is rotten, (ask the Old Man) put a series condenser in the lead. It's logical.

Yours truly,
1HAA.

CIRCUIT CORRECTION

198 King George St.,
Editor, QST:— Annapolis, Md.,

Referring to the circuit for "Radio-Frequency Amplification with A-P Tubes" on page 26 of January QST: Permit me to say that somebody made a slip on that diagram. As shown, the full voltage of the B battery is applied between the grid and filament of the detector tube. Of course that is wrong. The fault can easily be remedied by putting a condenser in the grid circuit of the detector tube. If a grid leak is required, it should be run directly to the filament circuit instead of just bridging the grid condenser. If the grid leak bridges the grid condenser the full B battery voltage will be applied to the grid leak. With any ordinary leak this would be pretty sure to make the grid voltage of the detector too high.

The circuit shown (after correcting as above) will probably be found to have both the advantages and disadvantages of very sharp tuning. If still sharper tuning is desired it can be obtained by making C larger and L correspondingly smaller if the effective resistance of the circuit formed by L, C, and the connections from L to C is made very low.

Respectfully,
J. D. Robinson.
Asst. Prof. Dept. E.E. & P., U. S. Naval Academy.

NEW KINDS OF QRN

944 Washington Ave.,
Bronx, New York.

Editor, QST:—

I read with interest in the December issue of QST, an article by C. C. Endly in reference to a peculiar forrm of interference with which he has met and notice that apparently he has arrived at a conclusion that this interference is not caused by atmospheric conditions.

I am a commercial operator and, having been on the Atlantic and South American runs for the last three years, have given a good deal of attention to the different forms of static encountered in wireless work.

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This form of interference which Mr. Endly mentions was met with while I was in Halifax during the month of January and continuing until the latter part of April, during which period frequent discharges lasting from 1 to 5 minutes were heard. A case indicating the intensity of these disturbances can be best illustrated by stating that during the month of February while in communication with (VCE) Cape Sable, N. S., wireless work was practically impossible for hours at a time, the discharges occuring in such rapid succession. After midnight, however, the air was perfectly clear again. Other operators to whom I later related the case, stated that doubtless it was caused by the Aurora Borealis that was unusually bright at the time.

On my last trip north from Buenos Aires when approximately 700 miles east of Miami, Florida, the temperature being about 80 degrees, we were troubled several times with the same interference and again when off Norfolk, Virginia.

In conclusion, I would like to state that to my mind this interference is due to some atmospheric disturbance but as to its cause I would not venture an opinion. A curious feature in regard to the discharges is that they have invariably taken place on a clear night and previous to a change of moon.

I would like to hear from Mr. Endly in regards to this problem, which is certainly an interesting one.

Respectfully yours,
C. W. Vollmer.

RE: RADIO HUMOR (Example Below)

To Readers QST Magazine
Suffering From Bum Humor,
Hon. Gents:—

Now that Xmas paper QST is finished read, and Hon. Old Man has reply to Hon. Squirt, with bum humor, I therefore send you this Hasty Delivery letter (price 10c) in which Japanese Reader make quick extortion regarding humor explayed by Hon. Old Man and Mr. Squirt, not mention Hon. Kruse, Hon. Vermilia, and other meaning-wellers.

Firstly, I should like to ask for why Hon. Old Man want to bring Govt. politics in argument between Hon. Squirt and himself? Every 23¼ hrs., I read in newsless papers of town all about Ohic fight and have now faced music of Candidates with resigned soul. Since Party of Efficiency has landed in White House, Hon. Americans have to take what comes, and sooner Hon. Harding is collected in W. House and Hon. Wilson finds Home in high-up Wash. D. C., all will be well. So, I ask, for why did Hon. Old Man bring in stale humor?

With reckless abandon of Hon. Cash of realm, I spend ten (10c) cents to ask you, Hon. Editor, why Readers of Great QST magazine have to be induced to bum humor explayed by above Hon. Gents. Friend Wife, which is name for lady who cooks rice and handles DX while operator eats, asks me for why Hon. Cat has to be moistened every time Hon. Old Man makes noise and fuss? In days before United States was made safe for Democrats, Hon. Old Man had radio club in which members contained were Hon. Radical, Hon. Final Authority, and others . . . For why, I write a letter, do Mr. Old Man bring in those of Ancient Cave-man time? Present time demand quick and original joke, not Hon. ressurrected name. Once before, I write question to Hon. Editor QST magazine, which tells all about radio, asking where charge of condenser go when plates taken apart. Now, this Question is puzzle me quitely, but when publish in QST magazine on paper, Hon. Readers make large fun of same Question. This was consider highly intellegently humor by members of Hon. A. R. R. L. when sent in by poor Japanese radio buglet hunting for Hon. radio information. This Question was answer by many Hon. Experts which same divulge to me for why charge remain on plates, with sparkle of humor. If Hon. Old Man is continue bum humor jokes and writings to Hon. Squirt poor Japanese schoolboy, which is now marry, will consider asking same question over again. To help Hon. readers of QST magazine, which has help more infortunates men in exploitation of radio signals through Hon. Air, I fill myself with duty and write above request for pipe-down on Hon. Cave-man humor which same is denote by Stone Age time, and ask to print more Calls Heard of stations or give picture photo of Hon. Maxim to fill up extra collums in magazine.

Hon. Vermilia seemingly funny man to children in pants short, but for man who is marry, same humor explayed by him is horrible example of Hon. Bud Fisher or Hon. Goldberg when same Hon. Gents are sober. Hon. Kruse which same is in Standard Bureau is no more funny since he took up job to find why Hon. Signals pass out on way to other stations. He is now Hon. Fader Expert. Hon. Warner's compartment which is label "Strays" contain more information regarding Signs of Times than humor, but when Hon. Reader get through perusing this compartment, he is laff more than 3 articles by Hon. Old Man, or Hon. Squirt.

Secondly and lastful, I should like ask for why Hon. Old Man write anyway? To poor deluded Jap which is try invest tips money in best advantages such as Food, Knock-down condensers (which same he is

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unable to knock-up) and QST magazine, this appearingly excellentful humor explayed by Hon. Old Man is blow to tickle-bone, latter persplained to me by physician doctor as place where good joke take effect, and to me seems useful in Hon. Turnsback's newsless paper which is full of Mexicanese air. Conclusionly, I write to say, Hon. Editor, whose varnished brain is able explain numerously intricateful problems to me through collums of QST phamplet, that Hon. Readers, including Hon. E. E. House, be spared by resulting bum humor of Hon. Old Man, Hon. Vermilia, Hon. Kruse, Hon. Wolfe and others radio bugs which is now got funny writings to send in.

Hoping you ar the same,
"FISHMARU HOBO."

LARGE HOLES IN PANELS

26 Highland Ave.,
Akron, Ohio.

Editor, QST:—

I believe I have hit upon a scheme which the fellows who build their own apparatus will appreciate.

I think that any one who has tried to cut a round hole an inch or more in diameter in Bakelite or hard rubber has found a big job on his hands.

I have found that an ordinary leather washer cutter used to cut round leather washers, is just the thing. It can be adjusted for various size holes and can be purchased at any hardware store. It fits into the ordinary wood brace.

By cutting half way thru on either side of the panel, a neat absolutely round hole can be cut. If the cutting edge is kept sharp it will not leave any unsightly burr on the surface.

Have also found that common white bath tub enamel when thoroughly dried makes a neat and cheap way of engraving a panel. It is not necessary to scratch the panel before applying the enamel. It can best be applied with a draftsman's ruling pen.

Respectfully,
A. S. Bachtel, 8IQ.

SCRANTON'S QRM

Toronto, Ontario,
5 Wells St.

Editor, QST:—

I read with interest a letter from Mr. P. O. McFarland on the subject of a peculiar QRM. I think Mr. McFarland will find that this "noise" is caused by the charging of the electrolytic lightning arrestors at the power stations in his city. We have the same trouble here, and get the same QRM anywhere from 200 to 4000 meters and it drowns out everything else. I have known it to last three or four hours. We can't do anything but wait until it is finished. The length of time depends upon the size in KV-A of the arrestor and the number in the bank. They are generally charged every night and work on the same principle as Dr. Radio's water and aluminum kick-back preventor. I am very sorry that nothing can be done to get rid of it, really the only thing Mr. McFarland could do would be to get the company to put in another type of arrestor, but I can't see them doing it. Not in our locality anyway. Hoping this may throw some light on the topic, I am

Yours very truly,
W. R. Carruthers, 3CE.

SPARK COILS

Kountze, Texas.

Dear Editor:

I would like to see spark coils come into greater use as short range transmitters. Most writers when referring to a spark coil transmitting set generally give instructions for a condenser and helix only, while the "ham", who causes so much trouble and prejudice against the spark coil, generally connects the spark direct in the aerial circuit. Neither of the above methods is efficient and it is hard to obtain a pure wave by using any other method than the oscillation transformer. While the helix may give a better radiation, that does not indicate its probable greater range. It is easy to see why a receiving station can get louder signals from a certain transmitter if all the energy is on one wave instead of being distributed over different tunes.

Last January I was using a half-inch spark coil in the standard O.T. hook-up with two cartridge shells for a spark gap, home made O.T. with ordinary white pine insulation, and standard Murdock spark coil condenser. A 6-volt storage battery furnished the "juice". I used a 6-volt battery lamp for a hot wire ammeter and tuning only with this as a guide, I got resonance on about 200 meters and with the bulb a little brighter than a bright glow. At best glow the spark gap was as short as possible without continually shorting while sending. This gives good quenching and full coupling can generally be used. The vibrator should be adjusted to give very low, smooth note. With this arrangement, on a single 100 foot wire 50 feet high at one end and 15 feet at the other, I have been repeatedly heard in Houston, a direct distance of 73 miles, and all on about 6 watts input. This shows what can be accomplished with a spark coil and by sharp tuning. To show what little total energy was being radiated the flashlight bulb was direct in the aerial circuit without a shunt or any other thing to keep it from burning out. A. P. Daniel first re-

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ported me weak and SHARP. Later, H. E. Worthington, 5BS, now 5ZV, wrote me a card saying he had heard me several different nites and he was quite sure 5YA got me also (I had a few nites previous called 5YA and upon having trouble with VT just got his QRA? so I didn't know for sure whether he answered ME or not) for he had answered my calls once. That is 125 miles away. Freak work of course, but so are the majority of other records by transformers, etc. With a better aerial, in winter, this should be repeated often.

Yours truly,
Arden Hooks, 5BB.

GENERATORS FOR C.W.

137 Hill Avenue,
Highland Park, Detroit, Mich.

Editor, QST:

Just a few lines to those amateurs who are experimenting with C.W. transmitters and who have difficulty in getting a source of high voltage for plate. I have picked up, from time to time, second handed motors which function perfectly as generators for high voltage. I have found several 220 volt, shunt wound low speed, 900 to 1200 rpm., D. C. motors which when coupled direct to an 1800 rpm. induction motor gave 450 volts and all the amperage required. Both motors are rated at 1/10 to 1/8 H. P. Using this in connection with 1 W.E. VT-2 I get a radiation of nine-tenths ampere with which I have worked Boston and many other eastern stations very Q.S.A. The generator and motor usually can be picked up for $20.00 each and it makes an excellent motor-generator set for the Amateur. I am giving you this information because I believe many Amateurs believe that it is necessary to spend a great deal of money for a motor-generator set before they can take up C.W. No trouble was experienced with commutator hum even on generators having only 16 segments in commutator.

Yours very truly,
Clyde E. Darr, 8CB.

GIVE HIM THE CELLULOID POKER

Ex 3AMP,
Baltimore, Md.

Dear Eddy:

How's this for the prize "ham" stunt of the year? The other day a very nice young operator blew in on us and wanted a "honeycomb" coil to receive 2500 meters. After he had purchased same, he asked if I could supply him with the "info" as to why the tuning coil that he had made would not work. He said that he knew that it was O. K. because he had looked in his arithmetic book and found that a meter is approximately three feet. (?) Therefore said Ham wound 7500 feet of No. 26 on a form. He was very indignant when I told him it was ALL WRONG.

If that bird doesn't get the cut glass golf ball, call me a "squeak-box" pounder.

As ever,
J. Holloway.

RADIO IN THE ARGENTINE REPUBLIC

Reconquista 46,
Buenos Aires, Argentine.

Editor, QST:

The writer, having read many articles in current radio publications on the very desirable outlets for American radio products in the South American countries, wishes to make clear on what footing wireless activities stand in one of the most if not the most progressive country in the Southern Hemisphere.

Radio in this great republic may be classed in three divisions: amateurs and private installations; ship-to-shore stations; and last but not least, the high powered installations for world-wide communication.

The first division, or amateur class, undoubtedly embodies the greatest field for the American manufacturer of amateur and commercial apparatus, for it is here that the rapid growth of interest in wireless affairs will show itself first.

At present there are but thirty officially licensed amateur stations, but this number would be increased very considerably were it not for the fact that every piece of apparatus, however small, must be imported, and of course the ruinous import taxes make apparatus just double its original price. When one takes into consideration that Argentine paper money is valued at a little less than one-half United States gold, it may be seen the installation of an amateur radio set is more a matter of money than anything else. Although amateurs here are still restricted to a transmitting input of fifty watts, and a transmitting wave length of three hundred meters, it is hoped that in the near future the amateurs will be allowed to use more power at a reduced wave length. In consequence of this low power input, radio telephony and continuous wave transmitters have been the rule, rather than the exception, this being the case even in the years before the Great War.

The second class, or ship-to-shore traffic, is handled in about the same fashion as in the United States, LIA, the government radio station at the North Basin, here in Buenos Aires, being the chief center for all traffic for the Republic.

Now we come to the third class, or high powered world-wide-stations. There are three companies actively engaged in the erection of high powered stations, namely: Compania Marconi del Rio de La Plata; The Pan-American Radio Telegraph & Telephone Company; and the "Trans-

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radio Compania Radio Telegrafica Argentina S. A. Besides these three the French Radio-Telegraphic Company has just applied to the Ministry of Marine for permission to install an ultra-powerful radio station.

The Radio Corporation of America has already started work on its stations at Maschwitz and Lujan, just outside of Buenos Aires. These transmitting stations will obtain their power from a central power house in which will be installed at least three and probably six Alexanderson alternators. The U. S. Government station NFF is conducting daily tests to determine the best sites for the corresponding receiving stations, as static conditions in this country are very bad. In fact the Transradio Compania Radio Telegrafica is spending a great deal of time and money trying to locate a place in the Argentine where static conditions are at a minimum, but so far has been unsuccessful. This company is erecting a transmitter of the Nauen type of 400 K.W. and expects to complete the installation by the first of 1922.

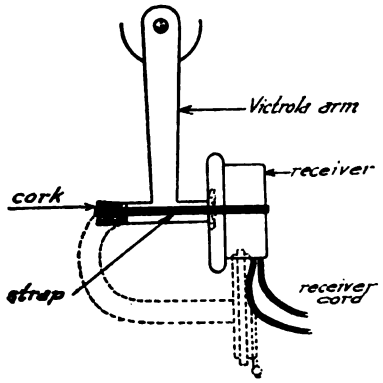
In concluding, the writer wishes to state that he will be very pleased to furnish further information to any one writing to him at the above address.

Yours truly,
Wallace A. Heckman, 1AA.

A SIMPLE LOUD-TALKER

236 Burns Ave.,
Editor, QST— Detroit, Mich.

I dropped a pair of Baldwin phones the other day, and one now refuses to respond. So I thought maybe I could use the other in some way. The loud talking apparatus, now so expensive, presented itself. I had an old Victrola that was passe, and I took



the sound-box off, and strapped the single good Baldwin to the end of the tube, and turned on the set. Sigs came in better than ever before. The swivel arm with its horizontal axis was removed, and a cork put in one end and the receiver on the other, as the sketch below shows:

The dotted lines outline the parts to be removed, while the solid lines show those in use and how to attach the phone.

Hoping this may be of some help, I am

Yours truly,
M. Crosby Bartlett, 8MC-"B".

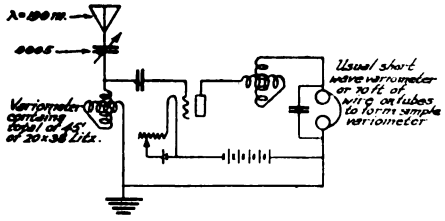
A SIMPLIFIED CIRCUIT

108 Pine St.,
Millville, New Jersey, 3AAN.

Dear Eddy—

Recently so many fones have started up a fellow sprains his wrists trying to hear both sides of a conversation when adjusting any of the well known regenerative sets. Well you know. A fellow may be strong, healthy and willing but an hour's work trying to get an earful of what two fones are saying will floor him all right. I have tried a number of circuits but found the one below the easiest to adjust and still obtained good amplification.

Using 45 ft. wire in form of a variometer for aerial inductance and shorting series condenser will cause circuit to respond to 700 meters using an aerial of 190 meters.



In order to make this circuit oscillate use minimum capacity (series) and max inductance. To receive waves of 200 it is necessary to use variometer near minimum and also series condenser near min. The circuit will not oscillate unless very small series capacity is used, due very likely to aerial absorbing energy too rapidly. Rapid adjustment can be had solely by the variometer rotation and no troublesome adjustment of coupling as when a regular set is used. It is very selective on the lower waves but not not on the tunes above 300. This is due to the small capacity necessary for short waves. I use as low as .0001 for 200 and get very good sigs. To amplify waves over 350 it is necessary to place one variometer to feed back but on 200 there should be no coupling between variometers.

This circuit is as sensitive as any short wave set on the market but not as selective, of course. Stations are heard every evening in every district except the 6 and 7. Strange to say local induction from arc lights is not as bad as on sets of the Paragon or Grebe type.

Yours truly,
Geo. P. Hamilton.

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CALLS HEARD

In addition to the following instructions please read references to this section on pages 30 and 58 in February QST.

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

If you will co-operate with us in this, no calls published will be over two months old, and their value will be greatly increased in that we can keep tab on how improvements in our transmitters are working out, etc. It will be our aim to publish representative lists, equally distributed over the country; and in general to conduct this department so as to be of the highest possible service.

HEARD AT SEA

Operator, WKV, Jan. 23d, 200 miles east of WSC, on crystal: 10E, 2TF, 8AHK, 3DH, 8NC, BDW, 8XK, 8ZL.

Operator, WKG, reports heard Jan. 22d, 180 miles west of Sand Key (Key West, Fla.): 2JU, 2RK, 3CS, 3DH, 3HG, 3RK, 4AN, 5BI, 5DO, 5EJ, 5FL, 5HI, 5JE, 5XB, 5YE, 5YI, 5ZA, 5ZK, 5ZX, 8HG, 8LR, 8XK, 8ZL, 8ZR, 8ZW, 9AAC, 9AEG, 9CA, 9EL, 9LA, 9LR, 9OX, 9PS, 9UU, 9YM, 9ZH, 9ZN, 9ZR.

Operator, KDEV, in Tampico, Mex., January: 5ZX, 4ZC, 5ZG, 5EJ, 5ZT, 5ZA, 5IS, 5HL, 5JS, 5BI, 5ZK, 5JM, 5ZS, 5ZV, 5XB, 5FL, 5EA, 5JE, 5ZU, 5YH, 5BR, 5JT, 5LR, 5LS, 6IG, 8GN, 9AE, 9YY, 9LR, 9EL, 9OE, BCO.

1TS, BRISTOL, CONN.—Jan., 1 Tube.

1AB C.W., 1ABI, 1AE spk. & C.W., 1AO, 1AR C.W., 1AE, (1AW), 1AZ, 1BAB, (1BBL), 1BL, 1CBX, 1CX spk. & C.W., 1CM, 1CP, 1CR, 1CY, (1CZ), 1DA C.W., 1DAP, 1DBM, 1DR spk. & C.W., (1DY), (1AES), 1EAT, (1EAV), (1EBW), 1EN, (1EP), 1ES, (1FBF), 1FL, 1FQ C.W., 1FU, 1FV, (1GAI), 1GAW, 1GBC, 1GBL, 1GBT, 1GJ, 1GM, 1GY, 1HAA, 1HAF, 1HBA, 1IHD, 1IZ, 1JAR, (1JBF) spk., C.W., & fone, 1JBT, 1JD, 1JQ, 1KAG, 1KAQ, (1KAZ) spk. & C.W., 1KBJ, 1KM, 1LAX, 1LBR, 1LJ, 1MAD, 1MB, 1MBS, (1NAQ), (1NAT), 1NO fone, 1OAD, (1OBH), 1OE, 1OJ, 1PBA, 1OQ, 1QN, 1QT, (1RAY), 1RV, 1RZ spk. & C.W., 1TAQ, (1TAZ), (1UD), 1UL, 1VAA, 1VAR, 1VE, 1WJ, 1WR, 1XE, 1XM, (1XN), (1XT), (1XV) C.W. & fone, (1XX) C.W., (1YB), 2AFF, 2AAX, 2ABM, 2ACB, 2AEF, 2AEP, 2AGC, 2AID, 2AIM, 2ARA, 2ARY, 2AXB C.W., 2AZP C.W., 2BB, 2BE, 2BEH, 2BGM C.W., 2BGR, 2BIP, 2BK, 2BM, 2BO, 2BZ C.W., 2CC, 2CS spk. & C.W., 2CT spk. & C.W. 2DA, 2DE, 2DI, 2DK, 2DN, 2DR, 2EL, 2FD, 2FG, 2FS C.W., 2GR, 2GU, 2HJ, 2HN, 2HZ C.W., 2IG, 2JJ, 2JN, 2JU, 2JZ, 2KQ spk. & C.W., 2KY C.W., 2LO, 2MP, 2NN, 2RM, 2RQ, 2RR, 2SS, 2SU, 2SZ, 2TB, 2TF, 2TS, 2UE, 2VA, 2VZ, 2WD C.W., 2XG C.W., 2XJ fone, 2XQ spk., C.W., & fone, 2XX C.W., 2YM, 2ZC, 2ZD spk. & C.W., 2ZL C.W., 2ZM, 3AAE C.W., 3AB, 3ABC, 3ABG, 3ACM, 3AHK, 3AIC, 3AK, 3BE, 3BG, 3BP, 3BZ, 3CC, (3DH), 3DR, 3DS, 3EN, 3FM, 3FR, 3GO, 3GX, 3HB, 3HG, 3HJ, 3HV, 3HX, 3IW, 3LS, 3NB, 3OB, 3PB, 3PU, 3QV, 3QW, 3RW, 3UC, 3UF, 3UX, 3VV, 3XC, 3XF, 3YH, 3YV, 3ZE, 3ZS 4BY, 4XB C.W., 8AAV, 8AB, 8ACF, 8AD 8ADV, 8AEE, 8AFM, 8AFO, 8AGB, 8AGK, 8AGO, 8AJW, 8AKA, 8AKJ, 8AL, 8ALE, 8ALY C.W., 8AMF, 8AMQ, 8AMZ, 8ANK, 8ANO, 8ANT, 8AOT, 8AP, 8APB, 8APH C.W., 8ARK, 8ARW, 8AY, 8BB, (8BC), 8BG, 8BO, 8BP, 8CAA, 8GG, 8CP, 8CQ, 8DC, 8DJ, 8DR, 8DT, (8DV), 8DY, 8F6, 8FE, 8FK, 8FN, 8FT, 8GI, 8GR, 8GW, 8HG, (8HP), 8ID, 8IK, 8IL, 8IV, 8IZ, 8JJ, 8JP, 8KD, 8KF, 8KH, 8KK, 8KM, 8KP, 8KU, 8KZ, 8LF, 8LG, 8LI, 8LM, 8LQ, 8LU, 8LV, 8MF, 8MH, 8ML, 8MP, 8MZ, 8NI C.W., 8NQ C.W., 8NZ, 8OI, 8OJ, 8OY C.W., 8OZ, 8PU, 8QJ, 8QM, 8RI, 8RQ, 8SH, 8SP, 8TT, 8UC, 8UO, 8VJ, 8VQ, 8VS C.W., 8VU, 8WY, 8XE, 8XH, 8XX C.W & rone, 8XS, 8XU, 8YA, 8YG C.W. & fone, 8YK, 8YR, 8YV, 8ZA, 8ZD, 8ZE, 8ZG C.W., 8ZI, 8ZL, 8ZQ, 8ZR spk. & C.W., 8ZT, 8ZV spk. & C.W., 8ZW spk. & C.W., 8ZY, 8ZZ, 9AAC, 9AAV, 9AAW, 9AIX, 9AU, 9BB, 9BP, 9CA, 9EQ, 9GP, 9HM, 9HY, 9JN, 9JQ, 9KI, 9KV, 9LM, 9LQ, 9LR, 9OX, 9PV, 9UH, 9UU, 9WE, 9XI C.W., 9XM spk., C.W., & fone, 9YA, 9YB, 9YC, 9YI, 9YM, 9ZB, 9ZJ, 9ZL, 9ZN, 9ZY C.W. & fone, NSF C.W. & fone, WWV.

1CK, BRAINTREE, MASS., Jan. 1-22

(1AK), (1AW), 1BBL, (1CM), 1DAC), 1EK, (1EAV), (1FV), (1GBC), (1HAA), (1OE), 1OW, (1RAY), 1TS, 1UQ, 1XF, (1XX), (1YB), 2AAE, 2AAX, 2ACM, 2AER, 2AID, (2AR), (2ARY), (2BB), 2BH, (2BK), 2BZ, 2CM, 2DA, 2DI, (2DN), 2DR, 2EL, (2HN), 2JJ, 2JN, (2JU), (2JZ), 2KK, 2LO, (2OA), (2OM), 2OO, (2RB), (2RK), 2RL, (2RM), 2SH, 2SQ, 2SZ, (2TF), 2UE, 2UK, (2VA), (2XQ), (2XX), 2YM, 2ZD, 2ZL, 2ZM, 2ZR, 3ABC, 3ACM, 3AHK, 3AIB, 3AIS, 3AK, 3BG, 3BH, 3BP, 3BZ, 3CC, 3CL, (3CM), 3CO, 3DC, (3DH), 3DR, 3DS, 3EE, 3EH, 3EK, 3EN, 3FM, 3GB, 3GO, (3HG), (3HJ), 3HX, (3KM), 3KV, 3LS, 3NB, (3OB), 3OU, (3PU), 3TJ, 3UC, 3VV, 3XF, 3YH, 3ZA, 3ZE, (NSF), 4AG, 4BY, 4EY, 5DA, 5YC, 5ZP, 8ACF, 8ADV, 8AEP, 8AFB, 8AIB, 8AIO, 8AJW, (8AKA), 8AKJ, 8AMZ, 8ANJ, 8ANT, 8AOE, 8AP, 8APB, 8ARW, 8ASU, 8AU, 8BB, 8BO, 8BP, 8BV, 8CG, 8DC, 8DI, 8DJ, 8DR, 8DV, 8EV, 8FA, 8FK, 8FW, 8GI, 8GW, 8HP, 8KZ, 8LF, 8LH, 8LI, 8LM, 8LQ, 8MZ, 8NI, 8NL, 8NZ, 8OI, 8PI, 8QM, 8RA, 8RQ, 8SP, 8TB, 8UH, 8UO, 8VJ, 8WV, 8WY, 8XH, 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8ZR, 8ZW, 8ZX, 8ZY, 8ZZ, 9AH, 9AU, 9CA, 9EE, 9EQ, 9KO, 9LM, 9LQ, 9PV, 9UH, 9UU, 9WE, 9XM, 9ZJ, 9ZL, 9ZN.

1DY, LYNN, MASS., Jan. 1-18.

(1AK), (1AW), 1CM, 1GZ, (1OJ), (1UD), 1OE, 1XT, (1XX) C.W., (1YB), (1DAC), (1BBL), 1BAB, 1FBF, 1GBC, (1HAA), (1RAY), (1VAA), 2AR, 2BK, 2DA, (2DN), (2EL), 2GR, 2IM, (2JU), (2JZ), 2LO, (2OA), 2OM, (2RK), 2SU, (2TF), 2RL, 2ZD, 2ZL C.W., 2ZM, 2AER, 2AAX, 2AJW, 2ARA, 3AB, 3BG, (3BZ), 3CC, 3CO, (3DH), 3DO, 3DS, (3GO), (3HJ), 3HX, (3KM), (3PU), (3UE), 3UC, (3VV), 3QW, 3XU, 3ZE, 3ACM, 3YH C.W., 3ABC, 3AHK, 8AB, 8CF, 8CW, 8DE, 8DR, 8FU, 8GI, 8GW, 8DV, 8HA, 8HG, 8HY, (8ID), 8IK, 8JS, (8KE), 8LM, 8LV, 8NM, 8OJ, 8PT, 8PU, 8FU, 8QM, 8SP, 8XK C.W., 8XE, 8WY, (8ZD), 8ZL, 8ZR C.W., 8ZW, 8ZV, 8AAZ, 8AGY, 8ARK,

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8ARW, 8CAA, 9CA, 9GV, 9OX, 9WO, 9LM, 9LQ, 8ZJ C.W., 9ZL, 9ZN, (NSF).

1FW, BRIDGEPORT, CONN., Jan. 6 to Feb. 12.
1AW, 1BBL, 1CAS, 1DY, ((1FAQ), 1FL, 1FM, 1GAS, 1GAX, 1HAA, 1JBC, 1JBN, 1JQ, 1NBG, 1OE, 1QN, 1RAY, (1RZ), 1TL, (1UAW), (1VAA), 1VBC, 1WAB, (1XN), 1XT, (1XX), 1YB, (2ABM), 2ABT, 2ACS, 2AE, 2AER, 2AGS, 2AHL, 2AID, 2AJF, (2AJW), 2AMR, (2AXB), 2AV, 2BF, 2BG, (2BGR), 2CS, (2CT), 2DA, (2DI), 2DN, 2DR, 2DT, 2EK, (2EL), 2FD, 2FS, 2GR, (2HJ), 2HK, 2IF, 2JIN, 2JJ, (2JU), 2JV, 2JZ, 2KQ, (2KY), 2LZ, 2OA, 2OI, 2OM, 2ON, 2OV, 2QR, (2RB), 2RK, (2RI), 2RQ, 2RR, 2SH, 2SP, 2SZ, 2TF, 2TK, 2UC, 2UE, 2UK, 2VA, 2VC, (2VD), 2XEN, 2XL, 2XP, (2YM), 2ZC, (2ZD), 2ZL, 2ZM, 2ZV, 3AFK, 3AHK, 3AK, 3BG, 3BH, 3BZ, 3CC, 3CO, 3CV, 3DH, 3EN, 3GO, 3GX, 3HC, 3HJ, 3HV, 3KM, 3KV, 3NB, 3ND, 3OU, 3PU, 3UC, 3QE, 3QR, 3SW, 3TW, 3XF, 3YV, 4FF, 4FR, 4OV, 4XB, 4XC, 5DA, 5KP, 8AAW, 8ABL, 8ACF, 8AD, 8AFO, 8AIO, 8ANK, 8APB, 8AT, 8ATN, 8AR, 8BC, 8BP, 8CG, 8DI, 8DL, 8DV, 8DZ, 8FG, 8FN, 8FT, 8GI, 8GT, 8GW, 8HA, 8HG, (8HP), 8JE, 8JO, 8GO, 8KK, 8KZ, 8MF, 8MN, 8MZ, 8NN, 8OJ, 8PN, 8PT, 8RI, 8RP, 8RQ, 8SL, 8SP, 8SR, 8TT, 8VJ, 8VQ, 8VW, 8WY, 8XE, 8XH, 8XK, 8XU, 8YG, 8ZA, 8ZE, 8ZD, 8ZG, 8ZIA, 8ZL, 8ZR, 8ZV, 8ZW, 8ZY, 9AU, 9GO, 9IM, 9ND, 9ZJ, 9ZL, 9ZN.

2TT, NEW YORK CITY, Dec. 3 to Jan. 29.
1AK, 1AS, 1AW, 1BAB, 1BBL, 1CK, 1CY, 1CZ, 1DY, 1EAV, 1EBW, 1EP, 1ES, 1FV, 1GAI, 1GBC, 1GBT, 1GM, 1HAA, 1JAP, 1LAX, 1OE, 1OW, 1RAY, 1TS, 1VAA, 1XM, 1XT, 1XX, 1YB, 2BB, 2BM, 2DA, 2SZ, 2TF, 3AAE, 3AB, 3ABC, 3ACI, 3AM, 3ACS, 3AHK, 3AIB, 3AIC, 3AQB, 3BG, 3BH, 3BO, 3BZ, 3CK, 3CM, 3CV, (3DH), 3DS, 3EN, 3FG, 3FR, 3GO, 3GX, 3HG, 3HJ, 3IB, 3JH, 3KM, 3LS, 3LY, 3NB, 3OB, 3OC, 3OU, 3PB, 3PU, 3RW, 3UC, 3UF, 3VV, 3XC, 3XF, 3YV, 8XA, NSF, WWV, 4AG, 4FF, 5XA, 5YH, 8AAZ, 8AB, 8AD, 8ADA, 8ACY, 8AGO, 8AJW, 8AKA, 8AL, 8ARW, 8AY, 8BO, 8CF, 8CG, 8CH, 8CV, 8DP, 8DR, 8DV, 8EF, 8EV, 8FAA, 8FK, 8FT, 8GB, 8GI, 8GW, 8HG, 8ID, 8IK, 8IV, 8JF, 8JJ, 8JU, 8KE, 8LF, 8LI, 8LM, 8MF, 8MG, 8NZ, 8OJ, 8OI, 8OZ, 8PI, 8PQ, 8RQ, 8SP, 8TT, 8UP, 8VJ, 8VQ, 8WY, 8XE, 8XH, 8XX, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8ZR, 8ZV, 8ZW, 8ZX, 8ZY, 8ZZ, 9AAW, 9AP, 9AU, 9AWX, 9CA, 8EQ, 9GC, 9HJ, 9JN, 9JQ, 9KN, 9KV, 9LQ, 9LR, 9OC, 9UH, 9XM (C.W.) ,9ZJ, 9ZL, 9ZN, 9MS, (8ZW, spk. C.W. & fone.)

2KV, RRONXVILLE, N.Y., January.
1AW, 1BBL, 1CBJ, 1CK, 1CM, 1CZ, 1DY, 1EBW, 1EP, 1HAA, 1IBD, 1IRJ, 1OE, 1WR, 1RAY, 1XF, 1XX, 1YB, 2SZ, 2TF, 3ABC, 3ACM, 3ACS, 3AD, 3AHK, 3AK, 3BG, 3BP, 3BR, 3BZ, 3CC, 3CO, 3DH, 3EN, 3FG, 3GO, 3HG, 3HH, 3HJ, 3HX, 3IB, 3KM, 8NB, 3ND, 3OB, 3OU, 3PB, 3UC, 3UX, 3VV, 3WL, 3XC, 3XF, 3YV, 3ZE, NSF, WWV, 4AG, 4BY, 4CM, 8AAZ, 8ACF, 8AD, 8AEE, 8AGO, 8AGQ, 8ARW, 8ATS, 8AY, 8BO, 8CG, 8DR, 8DV, 8DY, 8DZ, 8EV, 8FL, 8GI, 8GW, 8HA, 8HG, 8HP, 8HT, 8HY, 8ID, 8IK, 8JE, 8JP, 8JU, 8KK, 8LA, 8LF, 8LI, 8LQ, 8ML, 8NM, 8OI, 8PI, 8PQ, 8PT, 8SH, 8SP, 8UY, 8VJ, 8VQ, 8WI, 8WY, 8XE, 8XH, 8XK, 8XU, 8ZD, 8ZE, 8ZJ, 8ZL, 8ZR, 8ZW, 8ZY, 9CA, 9CC, 9EQ, 9GN, 9HM, 9HR, 9KV, 9LQ, 9MC, 9TD, 9UH, 9UU, 9WU, 9YB, 9ZB, 9ZJ, 9ZL, 9ZN.

2AEQ, BRONX, NEW YORK, CITY, January
1AK, 1AW, 1BBL, 1CK, 1CY, 1DY, 1FV, 1GY, 1GBC, 1HAA, 1JG, 1VAA, 1XX, 1YB, 2SZ, 2TF, 3ABC, 2AHK, 3AKV, 3BG, 3BZ, 3CK, 3DH, 3DS, 3EN, 3FR, 3HJ, 3IW, 3KM, 3KU, 3RW, 3UC, 3VV, 3XF, 3YV, 5XA, 8AAZ, 8ACF, 8AFB, 8AGK, 8AGW, 8AJW, 8AKA, 8AKJ, 8AKV, 8ALE, 8AMZ, 8ANK, 8ASH, 8AOT, 8BU, 8DC, 8DR 8DV, 8EV, 8GB, 8GW, 8HG, 8HJ, 8HP, 8HT, 8HR, 8ID, 8IK, 8IL, 8JE, 8JU, 8KK, 8LF, 8LH, 8LI, 8LM, 8LR, 8MF, 8ML, 8MZ, 8NZ, 8OI, 8OJ, 8PQ, 8VQ, 8SH, 8SP, 8TT, 8VAA, 8VJ, 8VQ, 8WY, 8XE, 8XH, 8XK, (spk. & fone), 8XU, 8ZD, 8ZE, 8ZL, 8ZR, 8ZW, 8ZY, 9AAC, 9CA, 9CP, 9ET, 9HT, 9JN, 9JT, 9LQ, 9LR, 9UH, 9UK, 9UU, 9ZJ, 9ZN, NSF, WWV.

2AUG, RIDGEWOOD, N. J., Indoor Aerial, Jan.
3BP, 3BZ, 3CO, 3DH, 3GN, 3GO, 3GX, 3HG, 3HT, 3LR, 3OB, 3PU, 3RO, 3SZ, 3UC, 3UF, 3YH, 3ZE, 3ABC, 3ABG, 3ACS, 3ACM, 3ALN, 4AG, 4AU, 4FF, 4XC, 5DA, 5FD, 5XA, 4ZA, 5ZC, 5ZU, 8AB, 8AD, 8AS, 8AY, 8CF, 8CG, 8CH, 8CX, 8DE, 8DG, 8DJ, 8DN, 8DP, 8DT, 8DV, 8FT, 8GI, 8GW, 8HA, 8HF, 8HG, 8HJ, 8HP, 8HY, 8ID, 8IK, 8IN, 8JE, 8JF, 8JJ, 8JQ, 8JS, 8JW, 8KI, 8LI, 8LM, 8LQ, 8LX, 8ML, 8MP, 8MT, 8MV, 8MZ, 8NI, 8NL, 8NM, 8OJ, 8PN, 8PS, 8PU, 8QM, 8QW, 8RA, 8SG, 8SH, 8SP, 8SY, 8TB, 8TK, 8TN, 8TV, 8UK, 8UY, 8VJ, 8VQ, 8WA, 8WR, 8WV, 8WY, 8XE, 8XH, 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8ZR, 8ZV, 8ZW, 8ZY, 8ACF, 8ACH, 8ADV, 8AEP, 8AGB, 8AHR, 8AIG, 8AJB, 8AJW, 8AKJ, 8AKV, 8AMZ, 8ANK, 8ANO, 8ARK, 8ARW, 8CII, 9AP, 9AQ, 9BZ, 9CA, 9EK, 9EQ, 9FS, 9HM, 9HN, 9HP, 9HR, 9IN, 9JN, 9KN, 9KV, 9LM, 9LQ, 9LR, 9MA, 9MH, 9MS, 9SU, 9TW, 9UH, 9VY, 9WU, 9ZB, 9ZL, 9ZN, 9ZZ, 9XM, 9AAV, 9AAW, 9ABL, 9AHR, 9ARB, 9ASL, 9AWX.

3HS, WASHINGTON, D. C., January
1AAY, 1BA, 1BB, 1BAB, 1BBL, 1CK, 1CM, 1DY, 1EBJ, 1FB. 1FK, 1GBC, 1GBT, 1HA fone, 1IR, 1MAD, 1OE, 1OW, 1QY, 1RR, 1RZ, 1RAY, 1TS, 1UF, 1XB fone & C.W., 1XX fone & C.W., 1YB, 2BG, 2BU, 2CM. 2DA, 2DI, 2FZ, 2GR, 2OA, 2OO, 2QK, 2QM, 2SZ spk. & C.W., 2XQ, 2XX C.W., 2YM, 2ZL C.W., 2ZM, 3BP, 3CC, 3GL, 3GQ, 3NC, 2PB, 3QW, 3XE, 3YE, 3YV, 3ZU, 4AG, 4AM, 4AU, 4AV, 4BN, 4CA, 4DM, 4EK, 4EY, 4XD, 5AM, 5DA, 5EL, 5IO, 5XA, 5ZP, 5BA, 8AB, 8AR, 8ADO, 8AEE, 8AEJ, 8ADQ, 8AEP, 8AFB, 8AGK, 8AKV, 8ANP, 8ARW, 8AZI, 8BP, 8BQ, 8BW, 8DE, 8EC, 8EF, 8FD, 8FI, 8FT, 8GJ, 8HJ, 8HK, 8HS, 8HY, 8IC, 8ICF, 8IE, 8IM, 8JI, 8JF, 8KK, 8KP, 8KR, 8KW, 8KY, 8KZ, 8LM, 8MF, 8NY, 8NZ, 8OJ, 8RH, 8RT, 8TD, 8TJ, 8TN 8TV, 8XE, 8YK, 8ZC, 8ZH, 8ZL, 8ZR, 9AU, 9AAW, 9ABL, 9ABW, 9AFO, 9AHY, 9ARJ, 9AWX, 9BM, 9CM, 9GJ, 9JL, 9PN, 9UK, 9VC, 9XM, 9XU, 9YB.

3EH, COLLINGSWOOD, N. J., January
1AAT, 1AS, 1AW, 1BAB, (1BBL), 1CK, 1CM, 1CZ, 1DY, 1EBW, 1FQ, 1FV, 1GBC, 1GBT, 1HAA, 1IRY, 1JA, 1JE, 1KAQ, 1LAX, 1LBR, 1OE, 1RAK, 1RAY, 1WR, 1XX, 1XE, 1XT, 2AX, 2AR, 2BB, 2BM, 2AIM, 2DA, 2DI. 2DM. 2DN, 2HN 2JU, 2NN, 2RL, 2RK, 2SZ, (2TF), 2ZM, 2ZL, 2ZR, 3ADT, 3AHH, 3BZ, 3CG, (3DH), (3EN), 3FG, (3GO), (3NB), 3QE, 3TA, 3UO, 3VT, (3VV), 3YV, (4AG), 4AL, 4AU, 4EL, (4EY), 4DA, 4BY, (4BQ), (4YB), 5DA, 5NL, 5PM, 8ACF, 8ARW, 8AZ, 8AGK, 8AKA, 8AGB, 8ARU, 8AEE, 8AY, 8AMF, 8ANJ, 8AB, 8AP, 8AAG, 8AMF, 8AD, 8AMZ, 8ADE, 8AFD, 8BO, 8BV, 8BU, 8PB, 8CD, 8CG, 8CF, 8DR, 8DV, 8DE, 8DC, 8DP, 8EY, 8EV, 8FK, 8FI, 8FT, 8FN, 8GW, 8GI, 8GBT, 8HF, 8HI, 8HP, 8HA, 8HY, 8HG, 8IL, 8IS, 8IK, 8IB, 8ID, 8JE, 8JF, 8JU, 8KP, 8LH, 8LQ, 8LU, 8MZ, 8NZ, 8NM, 8NF, 8QV, 8QH, 8QW, 8RQ, 8SP, 8TT, 8UO, 8VW, 8VK, 8WY, 8XU, 8XI, 8XM, 8XH, 8YK, 8YJ, 8ZR, 8ZY, 8ZS, 8ZA, 8ZX, 8ZQ, 8ZD, 8ZL, 8ZU, 8ZE, 9AY, 9AF, 9FK, 9FJ, 9HN, 9JN, 9JQ, 9KV, 9MK, 9MC, 9KL, 9LQ, 9NI, 9OX, 9RJ, 9SU, 9UH, 9UU, 9UF, 9UH, 9US, 9XM, 9YE, 9YR, 9ZJ, 9ZB, 9ZL, 9ZY.

3CA, ROANOKE, VA., January
1BBL, 1GBC, 1HAA, 1RAY, 1RU C.W., 1YB, 2AWL C.W., 2CC, 2DA, 2EL, 2RU, 2XA, 3ABC, 3ABF, 3ACS, 3AHK, (3BZ), 3CC, 3DH, 3EN, 3FB, 3FG, 3FN, 3GO, 3HG, 3HJ, 3JU, 3KM, 3PB, 3PU, 3VV, 3XF, 3XL C.W., 3ZM, 4AG, 4AU, 4BK, 4BY, 4CG, 4DA, 4XC, 4YB, 5DA, 5DO, 5ER, 5JD, 5YE, 8AB, 8ACF, 8AGJ, 8AIB, 8AKV, 8AOU, 8ARM, 8AY, 8CG, 8CH, 8DP, 8EC, 8EF, 8ID, 8IK, 8KP, 8KZ, 8ML, 8NL, 8NM, 8NQ C.W., 8PI, 8RR, 8SP, 8TJ, 8TN, 8UK, 8VJ, 8WY, 8XE, 8YV, 8XA, 8ZB C.W., 8ZL, 8ZR, 8ZV C.W., 8ZW. C.W., 8ZY, 9ABL, 9AEG, 9AOS, 9BW, 9BY, 9EL, 8EQ, 9FG, 9FS, 9GX, 9JL, 9JN, 9LF, 9LQ, 9MC, 9MH, 9QJ, 9UF, 9VJ, 9WW, 9ZJ, 9ZL, 9ZN.

4CN, BUENA VISTA, GA., Dec. 24-31
3AD, 3AH, 3CC, 3HG, 3HJ, 3VV, NSF (fone concert QSA), 4AG, 4AL, 4AM, 4AN, 4AT, 4AU, 4BK, 4BQ, 4CG, 4DI, 4DZ C.W.,QRA), 4EK, 4XC, 4ZC,

(Continued on Page 62.)

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No. 127 Gen. Radio flush 0-1 Amp	$7.75
No. 127 Gen. Radio flush 0-3 Amp	7.75
No. 127 Gen. Radio flush 0-10 Amp	7.75
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RHEOSTATS

214 Gen. Radio front or back mounted	$2.50
Paragon Rheo. front or back mounted	1.75
Mesco Porcelain base	1.40

BUZZERS FOR BUZZER MODULATION

Century 168 Buzzer	$2.50
Mesco No. 55 Buzzer	2.50
Mesco 251 Buzzer	.95

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0-1 flush	$6.50
0-3 flush	6.50
0-5 flush	6.50
0-50 Volts flush	6.50
0-500 Volts flush	15.00
0-50 Mil. Amp	6.50
0-100 Mil. Amp	6.50
0-300 Mil Amp	6.50
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0-3 Amp	18.00
0-5 Amp	18.00
0-10 Amp	18.00

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4FD, MIDVILLE, GA., Jan. 1-12

1AW, 1ER, 1OE, 2GR, 2VU, 3AB, 3BL, 3BQ, 3CC, 3EN, 3FS, 3GO, 3G R,3HJ, 3KM, 3OB, 3PU, 3VV, 3ABC, 3ACS, 3ABG, 4AL, 4AM, 4AN, 4BK, 4BQ, 4AU, 4CB, 4CG, 4EK, 4EY, 4XA, 4XC, 5BY, 5CG, 5CI, 5CL, 5DA, 5ER, 5EJ, 5HL, 5KL, 5LA, 5LC, 5LS, 5LP, 5LX, 5YE, 8CF, 8DC, 8EF, 8FJ, 8FM, 8FT, 8GB, 8GO, 8HG, 8ID, 8IK, 8JU, 8KH, 8KM, 8LE, 8LL, 8LP, 8NM, 8OE, 8OP, 8QJ, 8SP, 8TT, 8UK, 8VJ, 8WS, 8WY, 8XX fone, 8AAK, 8AAL, 8ACF, 8AFB, 8AIB, 8ALE, 8ALM, 9AC, 9AP, 9EL, 9ET, 9FU, 9GC, 9GX, 9HG, 9JT, 9KO, 9LB, 9LL, 9LM, 9LX, 9MC, 9MJ, 9OE, 9OX, 9RL, 9UF, 9UH, 9UK, 9UU, 9VC, 9VS, 9WE, 9AAW, 9AAN, 9ABH, 9ABL, 9ABR, 9ACF, 9ACN, 9AEE, BCO, NSF fone

4BX, WILMINGTON, N. C., January

1BBL, 1HAA, 2DA, 2CO, 2EH, 2GR, 2PU, 2QR, 2RK, 2SZ, 2TF, 2UC, 2ZA, 2ZL, 2ZM, 2ZC, 3AHK, 3AFK, 3DM, 3HB, 3DH, 3XF, 3XL, 3YE, 3YV, 3ZR, 3ZB, 3ZR, 4AN, 4AT, 4AO, 4AN, 4EP, 4DZ, 5YE, 5DA, AHK, 8ARK, 8ARW, 8AEY, 8BP, 8DJ, 8HA, 8IV, 8JS, 8LD, 8UY, 8XE, 8VS C.W., 8XK phone, 8YK, 8YR, 8YV, 8ZA, 8ZD, 8ZL, 8ZT, 8ZV, 8ZW, 9AAC, 9AL, 9FS, 9GS, 9LQ, 9LZ, 9QM, 9TWB, 9ZB, 9ZN, 9ZY, 9ZJ, 9YC.

5ZZ, BLACKWELL, OKLA., Dec. and Jan.

1IR, 1WC, NSF, 3EP, 3CK, 4BK, 4XE, 4CP, (5AI), (5AO), (5BI), ((5BO), (5BW), (5BX), (5CI), 5CK, (5CG), 5DA, (5EA), (5DW), 5ER, 5EJ, 5ES, 5EW, 5FA, (5FL), 5FN, 5HK, (5HK), 5IO, 5JA, 5JE, 5JS, 5JD, (5IF), 5IP, 5LA, 5LR, 5LK, 5LL, 5LO, 5PM, (5WC), (5XB) (5YE), (5YI), (5YM), (5ZA), 5ZC), (5ZF), (5ZG), 5ZK, (5ZL), (5ZN), 5ZP, (5ZR), (5ZS), (5ZT), (5ZU), (5ZW), (5ZX), 6EO, 6EG, 6IG, 6GE, 6JI, 6ZM, 7CC, (7IM), 8AF, 8BP, 8CF, (8DI), 8FI, 8FT, 8JJ, (8QJ), 8LV, 8SP, 8ZC, 8ZJ, 8ZL, (8ZL), 8ZR, (8ZV), 8ZW, (8ZY), 8ZZ, 9AP, 9AR, 9AY, 9AK, 9AAC, 9ABI, 9ACN, 9ALP, 9AIG, 9AIC, 9ALX, 9ALI, 9ALG, 9AKC, 9ALK, 9AMB, 9AOX, 9AOJ, 9AQG, 9ARK, 9ASO, 9ATL, 9AUO, 9AUX, 9AWN, 9AXU, 9AWJ, 9AXA, 9AWG, 9AYI, 9CK, 9ET, (9FL), (9FM), 9EW, 9FN, 9FT, 9FS, (9JN), (9HN), (9HI), (9HL), 9HQ, 9GO, 9GC, 9GR, (9HT), 9HR, 9HK, 9JX, (9JA), 9JS, 9JB, 9JC, (9IF), 9KD, (9KV), 9LA, (9LC), 9LZ, 9LQ, 9LW, 9NC, 9MH, 9MC, 9NL, 9MC, 9PN, 9OG, 9OC, 9QM, 9QG, 9QQ, 9RY, 9RR, 9RV, 9SL, 9TW, 9SE, 9TH, 9SY, 9SZ, 9VK, 9UR, 9UU, 9VC, (9ZB), (9ZC), 9ZH, (9ZJ), (9ZL), (9N), (9ZQ), 9ZS, (9ZT), 9ZV, (9ZX), (9ZY), (9YA), (9YI), (9YM), 9YW.

5YB, JACKSON, TENN., Jan. 18 to 25

1OE, 2RK, 2SZ, 3CS, 3EN, 3HJ, 3HX, 3VV, 3YH, 4AG, 4XC, 5AQ, 5BI, 5ER, 5HL, 5HN, 5XU, 5YE, 5ZC, 5ZL, 5ZX, 8AEY, 8AS, 8BK, 8BO, 8BP, 8EZ, 9FK, 8HG, 8HN, 8HT, 8ID, 8IH, 8IK, 8KK, 8LF, 8LU, 8LV, 8LW, 8NZ, 8OJ, 8UI, 8UY, 8VJ, 8XE 8XH, 8ZL, 9AA, 9AAC, 9ABX, 9AEG, 9AH, 9AIM, 9ASL, 9ATL, 9AVW, 9CA, 9CS, 9DU, 9EK, 9EL, 9EQ, 9HG, 9HI, 9HT, 9HY, 9JT, 9KL, 9KR, 9LR, 9MC, 9MS, 9NJ, 9NQ, 9OE, 9OX, 9OY, 9PS, 9PV, 9QO, 9UF, 9UH, 9UJ, 9UU, 9UW, 9VJ, 9WE, 9XM, 9YM, 9ZB, 9ZN, 9ZS, 9ZT, BCO, NSF.

5ZC, DALLAS, TEXAS, January.

1IR, 2XB C.W., 2ZL C.W. on QSS test, 4BY, 4AG, (5AI), (5AL), (5AJ), (5BI), (5BJ), 5CE, (5CI), (5CG) calls fifteen times, 5CL, (5DW), 5DO sends QST ten times, 5ER, (5EJ), 5EB, (5FL), (5HL), (5HV), (5IS), 5IF, (5IP), 5JS, 5JH, (5JA), 5JD, 5JI, 5JE, 5KO, (5LC), 5LB, 5LL, 5LG, 5LK, 5YM, 5YE, (5YH), 5YU, 5XI, (5ZA) (5ZB), (5ZK), (5ZL), (5ZP), (5ZF), (5ZT), (5ZU), (5ZW), (5ZX), 6IG, 6ZH, 8AN, 8AEY, 8BP, 8FK, 8GY, 8ID, 8IK, 8KT, 8SP, 8ZG, 8ZL, 9AA, 9AF, 9AE, 9AY, 9ABX, 9AAC, 9ARA, (9AGE), 9ARJ, (9AFX), (9AEQ), 9AHL, (9BW) spark and C.W., 9CA, 9CRR, (9EE), 9FY, 9FU, 9HT, 9HI, (9HN), 9IIC, 9ICN, 9JT, (9JN), 9JU, 9KW, 9KO, (9KV), (9LR), 9LL, 9LW, 9MO, 9MC, 9NQ, (9OE), 9ON, 9QU, 9RY, 9SU, 9VR, 9WI, 9XB, 9XI C.W., 9XM spk. & fone, 9YA, 9YY, 9YI, 9YTA, 9YO, 9ZB, 9ZL, (9ZN), 9ZJ, 9ZW, NSF.

6AE, STANFORD UNIVERSITY, CAL., Sept. 20 to Jan. 24.

(5XD), 5ZA, (6AAK), 6ADL, 6BQ, (6CT), (6CU), 6DA, 6DH, (6EA), (6EB), 6EC, (6EL), 6EN, (6ER), (6FE), 6FD, (6FT), 6GC, 6GE, 6GF, 6GH, 6HK, (6HY), 6IF, (6IG), (6IL), 6IU, 6JC, (6JD), (6JI), (6JM), (6JT), 6KA, 6KE, 6KP, 6KQ, 6KS, 6MY, 6MZ, 6OL, 6OT, (6PE), 6PQ, 6QM, (6QR), 6RE, (6SK), 6TX, 6UO, 6WI, 6WZ, 6XZ, 6ZA, 6ZB, (6ZH), 6ZL, (6ZM), 6ZN, 7AD, 7BH, (7BP), 7BR, (7CC), 7CE, 7CR, (7CU), (7CW), (7DA), 7DH, 7ED, 7EX, (7GQ), 7GY, 7HN, 7IN, 7IM, 7IU, 7KK, 7KO, (7YA), (7YS), 7ZA, (7ZB), 7ZH, (7ZI), 7ZJ, 7ZK.

6EC, ANAHEIM, CAL., January

5ZA, 6AK, 6AN, 6AT, 6AAK, 6AMP, 6ACY, 6ADX, 6AN, 6AFW, 6AFY, 6AGN, 6AGP, 6AHA, 6AHQ, 6AHU, 6AIL, 6BJ, 6BQ, 6CU, 6CV, 6DA, 6DK, 6DP, 6DR, 6EA, 6EB, 6EJ, 6EK, 6EN spk. & C.W., 6ER, 6FI, 6GF, 6GI, 6HH, 6HY, 6IF, 6IG, 6IL, 6IR, 6IT, 6IU, 6JD, 6JI, 6JJ, 6JR, 6KA, 6KM, 6LK, 6OH, 6PQ, 6SK, 6TL, 6XZ, 6ZH, 6ZR.

6ABA, ALTADENA, CAL., Jan. 1—Feb. 14.

6AC, 6AF, 6AK, 6AN, 6AT, 6CH, 6CO, 6DH, 6DK, 6DP, 6EJ, 6FN, 6FV, 6GN, 6GY, 6JN, 6JR, 6LN, 6NF, 6NY, 6OW, 6PD, 6TC, 6TL, 6ACM, 7IN.

6TG, OJAI, CALIF., Oct. 15—Jan. 29

6ADL, 6ADU, 6AHQ, 6BF, 6BU, 6CU, 6EU, 6EN, 6ER, 6HH, 6IF, 6IG, 6IQ, 6JD, 6JM, 6JR, 6JY, 6KA, 6KI, 6KM, 6KP, 6MZ, 6NY, 6OH, 6OL, 6OS, 6PL, 6PQ, 6QB, 6QR, 6SD, 6TL, (6VZ), 6WI, 6WN, 6XZ, 6ZE, 6ZR.

AIR MAIL RADIO STATION, ROCK SPRINGS, WYO. January.

1AW, 2RK, 3DH, 4AN, 5BI, 5IF, 5XD, 5ZA, 5ZC, 5ZH, 5ZJ, 5ZU, 6AAK, 6AE, 6AFU, 6ACD, 6ADL, 6AH, 6AK, 6AT, 6BAC, 6BJ, 6BP, 6BQ, 6CO, 6CV, 6DP, 6EA, 6EB, 6EJ, 6EV, 6FD, 6FI, 6GE, 6GI, 6IG, 6JD, 6JI, 6JJ, 6JR, 6JT, 6KA, 6KM, 6LK, 6LN, 6MK 6OI, 6PO, 6PR, 6QR, 6RE, 6SJ, 6TA, 6VS, 6ZA, 6ZH, 6ZM, 6ZN, 6ZO, 6ZR, 7CC, 7DA, 7EX, 7IN, 7JX, 7KB, 7KT, 7LN, 7TK, 7XD, 7YA, 7ZG, 7ZJ, 7ZK, 8HG, 8ZW, 8ZL, 9AAC, 9AAW, 9ABX, 9AC, 9AEG, 9AEQ, 9AEY, 9AGN, 9AIF, 9AIG, 9AMB, 9AWG, 9AWS, 9BR, 9BW, 9EQ, 9EZ, 9HI, 9HM, 9HN, 9HQ, 9HT, 9IA 9IG, 9JM, 9JN, 9JU, 9KV, 9LC, 9LP, 9LR, 9LW, 9MQ, 9MS, 9NQ, 9OE 9ON, 9RV, 9SW, 9UQ, 9UT, 9WU, 9WG, 9XI, 9XI, 9XM, 9YA, 9YI, 9YM, 9YT, 9YW, 9YY, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZQ, NSF.

7ZJ Ex-7CU, VANCOUVER, WASH., January.

(5ZA), 6AAM, 6AAT, 6AAW, (6ACD), (6AE), 6AFN, (6AFU), 6AFY, 6AGF, (6AH), (6AK), 6AN, 6AR, (6AS), (6AT), 6BAC, (6BB), 6CH, 6CO, 6CV, 6DK, 6DN, (6DP), (6DY), (6EA), 6EB, (6EJ), 6EK, 6EN, (6ER), (6EX), (6FH), (6FI), 6FN, (6GF), 6GI, 6GK, (6GR), 6GY, 6HH, (6HP), (6IC), 6IF, 6II, 6IQ, 6IT, 6IY, (6JD), (6JN), (6JR), (6JT), (6KA), 6KM, 6KZ, 6NH, 6NO, (6OC), (6OH), 6OT, (6PM), 6PO, 6PQ, (6PR), (6QR), 6RE, (6TC), 6UM, 6VS, 6VX, (6ZA), (6ZE), (6ZH), 6ZK, 6ZM, (6ZN), (6ZO), 6ZQ, (6ZR), 6ZU, (7AD), 7AY, 7BC, 7BF, 7BH), (7BQ), (7BV), (7CA), (7CC), (7CE), (7CW,) 7DM, 7DR, (7EX), (7GQ,) (7HE), 7HS, (7IM), (7IN), (7IU), 7JR, (7JX), (7LN), (7YA), 7ZG, 7ZH, 9EE, 9EQ, 9LR, 9OE, 9ZN, 9ZQ.

7DA, PORTLAND, ORE., Dec. 27 to Jan. 20

(5ZA), (6AE), (6AH), (6AK), 6AN, 6AR, (6AS), 6AT, (6BB), (6BJ), 6CH, 6CO, (6CP), (6CV), 6CZ, 6DJ, (6DK), 6DP, (6DY), (6EA), (6EB), (6EJ), 6EN, (6ER), (6EX), 6FE, 6FH, (6FI), 6GI, (6GK), 6GO, 6GR, 6HF, (6HP), 6HY, 6IL, (6IU), (6JD), (6JN), 6JP, 6JR, 6JT, (6KA),

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(6KL), (6KM), (6KP), 6KQ, 6KZ, 6NG, (6NH), 6NO, (6OC), (6OH), 6OT, (6PO), (6PR), (6QR), (6TC), 6UM, 6UO, 6XZ, (6ZA), 6ZE, 6ZH, (6ZK), (6ZM), (6ZN), (6ZO), (6AAT), (6AAW), 6ACD, (6AEA), (6AFN), 6AGB, 6AGF, 6AIK, (7AD), 7AE, (7BC), (7BQ), (7BV), (7CC), (7CE), 7CN, (7CW), (7EX), 7FB, 7FL, (7GQ), 7HF, 7IM, (7IN), (7IU), 7JJ, 7JR, (7JX), (7LN), 7XD, (7YA), 7ZG.

GEO. W. DAVIS, COUDERSPORT, PA., Jan.
1AE, 1AW, 1BAB, 1BBL, 1BY, 1CBX, 1CH, 1CV, 1CY, 1EP, 1FV, 1GBC, 1GBT, 1HA, 1HAA, 1JQ, 1OE, 1PU, 1QL, 1RAY, 1RQ, 1XT, 1XX, 2AA, 2APB, 2AR, 2ARW, 2BZ, 2CC, 2CE, 2CM, 2DA, 2DN, 2DR, 2EL, 2JJ, 2JU, 2LD, 2OA, 2OO, 2OR, 2PB, 2QD, 2QM, 2RB, 2RK, 2ZA, 2ZD, 2ZL, 3AAG, 3ABC, 3ABG, 3ABK, 3ACM, 3ACS, 3AHK, 3AIC, 3BH, 3BG, 3BM, 3BO, 3BZ, 3CC, 3CG, 3CM, 3CQ, 3DF, 3DH, 3EN, 3FB, 3FG, 3FK, 3FR, 3GH, 3GO, 3GZ, 3HG, 3HJ, 3HV, 3HX, 3IW, 3KK, 3KM, 3KN, 3LS, 3NB, 3OU, 3PB, 3PS, 3PU, 3QW, 3TJ, 3VC, 3VV, 3XF, 3XL, 3YB, 4AI, 4AO, 4BY, 5DA, 5ER, 5ZA, 8AAG, 8AAZ, 8ACF, 8AGS, 8AEE, 8AEL, 8AFD, 8AGB, 8AGD, 8AGO, 8AI, 8AJW, 8AKJ, 8AMQ, 8AMU, 8AMX, 8ANB, 8AND, 8ANK, 8ARK, 8ARO, 8ARW, 8BO, 8CE, 8DC, 8DE, 8DH, 8DJ, 8DP, 8DQ, 8DR, 8DV, 8EA, 8EF, 8FG, 8FI, 8FK, 8FN, 8FQ, 8FT, 8FV, 8FW, 8GA, 8GE, 8GI, 8GL, 8GT, 8GW, 8HA, 8HF, 8HG, 8HJ, 8HP, 8HQ, 8HY, 8ID, 8IE, 8IIZ QRA?, 8IK, 8JE, 8JJ, 8JQ, 8JU, 8KP, 8KQ, 8LB, 8LH, 8LF, 8LM, 8MT, 8MZ, 8NZ, 8OI, 8OQ, 8PN, 8PQ, 8PU, 8QC, 8QJ, 8QM, 8RI, 8RQ, 8SH, 8SP, 8TK, 8TN, 8TT, 8UP, 8VQ, 8WY, 8XE, 8XK, 8XQ, 8XU, 8ZA, 8ZB, 8ZE, 8ZI, 8ZL, 8ZR, 8ZV, 8ZW, 8ZY, 9ABL, 9GX, 9HR, 9KV, 9LQ, 9LX, 9MC, 9UH, 9YB, 9ZB, 9ZJ, 9ZL, 9ZN, NSF.

8WA, DETROIT, MICH., January.
1RA, 2BK, 2DN, 2JJ, 2KB, 2RK, 3AA, 3ASK, 3BP, 3CC, 3DE, 3DH, 3EN, 3HJ, 3HK, 3HX, 3KE, 3KM, 3LM, 3NC, 3VV, 4HL, 5LO, 8AB, 8ACF, 8AD, 8AGO, 8AIO, 8DG, 8FT, 8GI, 8HP, 8IL, 8JE, 8KH, 8KV, 8LV, 8NI, 8NZ, 8QJ, 8RI, 8SP, 8UY, 8VQ, 8WY, 8XE, 8XH, 8XU, 8ZD, 8ZI, 8ZL, 9AAC, 9AC, 9AE, 9AGN, 9AOX, 9AWG, 9AWX, 9CL, 9EL, 9EQ, 9GU, 9GX, 9HM, 9HN, 9JN, 9KC, 9KN, 9KO, 9LC, 9LQ, 9OX, 9PN, 9TO, 9UH, 9UK, 9UU, 9WW, 9ZB, 9ZC, 9ZN, 9YM, NSF.

ALL C.W., 8ZG, SALEM, O., January.
1AE, 1CF, 1XX, (2CS), (2ZL), (3AAE), 3XL, (4XB), (8NQ), (8VS), (8AGZ), (8JM), (8ZW), (8JU), (8ZV, 8OZ, 8PW, 8YG, 8ZR, 8ZX, 9XI, 9YM, 9XZ, (9XM), XB1, (XF1), (XK1), (FAS).

8WE, ELMIRA, N. Y., January.
1AE, 1AW, 1BAB, 1BBL, 1CF, 1CK, 1CM, 1CZ, 1CBX, 1DY, 1GBT, 1HAA, 1HO, 1JR, 1MAD, 1NAQ, 1OE, 1RAY, 1RZ, 1XT, 1XX, 2AM, 2AR, 2AID, 2AWL, 2AXB, 2AXL, 2BA, 2BB, 2BM, 2CC, 2DA, 2DH, 2DI, 2EL, 2FG, 2JU, 2KM, 2OO, 2UC, 2XQ, 2XX, 2ZL, 3ACS, 3BG, 3BL, 3BZ, 3DD, 3DH, 3DS, 3EN, 3FB, 3FG, 3HG, 3HJ, 3KM, 3PU, 3UC, 3VV, 3XF, 3YH, 3ZE, 4AG, 4AL, 4BK, 4BY, 4XB, 5DA, 8AB, 8AJ, 8AM, 8AAG, 8ACF, 8AFE, 8AMQ, 8ANJ, 8ANK, 8AOE, 8APB, 8BP, 8CG, 8DE, 8DJ, 8DV, 8EC, 8EI, 8FG, 8FN, 8GI, 8GW, 8HG, 8ID, 8IK, 8KM, 8KP, 8KZ, 8LH, 8ML, 8NI, 8NZ, 8PQ, 8PW, 8RQ, 8SH, 8SP, 8TT, 8VJ, 8WY, 8XE, 8XK, 8XU, 8YV, 8ZA, 8ZE, 8ZR, 8ZV, 8ZW, 8ZY, 9ABL, 9FS, 9FU, 9JA, 9JN, 9LQ, 9LX, 9MC, 9ZJ, 9ZL, 9ZQ.

8ZR, MANSFIELD, OHIO, Nov. 1—Feb. 1.
1AW, 1GBT, 1HAA, 1IRY, 1XB, 2AHK, 2BK, 2CD, 2DA, 2DN, (2GA), (2GR), 2JU, 2JS, 2KN, 2LL, 2RK, 2TF, 2XV, (2ZM), (3AHK), (3ABC), 3BH, 3BL, 3BP, 3CC, (3DH), 3DJ, (3EN), 3HJ, 3HX, 3IF, (3NB), 3PN, 3QW, 3VV, 3XF, 3YH, 3YV, 4AD, 4AG, 4AN, 4BK, 4CG, 4XBCW, 4XD, AZA, 5AJD, 5DA, 5DO, 5EA, 5ER, 5HC, 5JE, 5XA 5XB, 5XE, (5YE), (5YH), 5ZC, 5ZP, 5ZS, 8PN, (8DF), 8RI, (8SP), (8VS C.W.) 8VQ, 8WP C.W. (8XI), (8XK), 8YH, 8XR, (8ZA), (8ZD), 8ZM, (8ZP), (8ZV), 8ZX, (8AL), 8AY, 8ACF, 8AEE, (8AGB), 8AGK, 8AJL, 8AKV, 8ANK, (8BO), (8BP), 8DP, 8DR, (8FK), 8FN, 8FS, 8FT, 8GI, (8GJ), 8GM, 8GW, (8GX), (8HG), (8HI), 8IJ, 8KP, 8KZ, 8LM, 8LV, 8NM, 9AD, 9AAC, 9ABL, (9AEQ), 9AHS, 9ADN, 9ATL, 9AWG, 9BP, 9BY, 9BW C.W., 9BY, 9CA, (9EQ), 9FN, 9FV, (9GS), 9HI, (9HM), 9HR, (9JL), 9JQ, 9JN, 9KK, 9KM, 9LG, (9LQ), (9LR), 9MC, 9NH, 9OX, 9QJ, 9QO, 9SQ C.W., (9VV), 9VH, 9VA, 9VW, 9WE, 9XI C.W., (9XW), 9YA, 9YI, 9YM, (9ZL), (9ZJ), 9ZQ.

9LQ, INDIANAPOLIS, IND., Jan. 8 to Feb. 8th.
(1AW), 1HAA, (1IR), 2IM, 2JU, (2RK), 2RL, 2SZ, 3AR, (4CD), 4EK, 5AM, 5BB, 5BI, 5BM, 5BR, (5DA), 5DO, (5ED), 5FD, 8AY, (8BP), 8CU, 8DE, 8DJ, 8FI, 8FK, 8GE, 8GI, 8GW, (8HA), 8HG, 8HW, (8ID), (8IK), 8JE, 8JJ, 8JT, 8JU, (8KI), (8KP), (8LQ), 8LW, 8LV, 8ML, 8NM, 8NZ, 8ON, 8OI, 8OT, (8QJ), 8SP, 8TT, 8WY, 8UT, 8UY, 8VJ, (8AGK), (9AJ), 9AY, 9BB, 9BL, 9CP, 9DV, (9EC), (9EQ), (9FN), 9FQ, (9FS), 9GB, (9GN), 9GP, 9GW, (9GS), 9HM, (9HN), 9HP, 9HR, 9HW, 9JL, (9JN), (9JQ), 9JT, 9JV, 9KL, 9KM, 9KO, (9KR), (9KV), (9LC), 9LF, (9LR), 9LW, (9MC), (9OE), 9OR, 9OS, 9OX, 9TI, (9PD), (9PS), 9RL, 9RY, 9UC, (9UK), 9US, 9VC, 9VS, 9WA, 9WU, (9AAC), (9ABH), (9ABL), (9ABX), 9ABZ, 9ACB, 9ACL, 9ACW, (9AEG), 9AEQ, (9AFO), 9AHD, 9AHI, 9AKC, 9AKH, 9ALI, 9AON, 9ARG, 9ARW, 9ASL, (9AVO), 9AYE, 9IFU.

9CA, MINONK, ILLS., Jan., Every District.
1AW, 1CK, 1DY, 1HAA, (2BK), 2CS, 2DN, 2DR, 2GR, (2JZ), 2PL, 2RB, (2RK), 2SZ, 2TF, 2TS, 2UC, 2UE, 2AHK, 2ZD, 3BZ, (3DH), 3EN, 3GO, (3HG), (3HJ), (3HX), (3IW), 3LP, 3PU, (3VV), 3WL, 4AGG, (4BY), (4CG), (4XC), (5AL), 5BI, (5CA), 5EJ, 5EW, 5FL, 5JE, 4JG, 5JW, (5JS), (5XA), 5XB, (5YH), (5ZA), 5XC, 5ZG, 5ZL, (5ZP), 5ZU, 5ZX, 6EB, 6ER, 6JD, 6JT, 6KA, 6KP, 6ZA, 6ZK, 7DA, 8AB, 8AG, 8AL, (8BO), 8DV, (8K), (8FT), 8FU, (8GX), 8HG, (8ID), (8IK), 8JJ, 8KM, (8LU), 8LV, 8MF, (8MH), 8ML, 8MT, (8NZ), 8PJ, (8PM), 8RE, 8RG, (8RQ), 8TT, 8UJ, 8VJ, 8VQ, 8WO, 8WV, (8ADE), (8AGO), 8AIO, 8AJW, 8AKV, (8ANH), 8ANK, 8ANT, 8ATN, (8XH), 8XK C.W., 8ZB, 8ZD, (8ZL) 8ZR, 8ZT, C.W., (9YM C.W.) 9XM C.W., 9DQ C.W. 8ZW, 8ZY, 9XI C.W. VY QSA., 9ZT C.W., 9CD

9ZN, CHICAGO, Dec. 1—Jan. 27, Every District
1AR, (1AW), 1BAB, 1BBL, 1CK, 1DY, 1EA, 1ED, 1NG, (1HAA), (1JAP), (1RAY), 2AR, 2BK, (2DN), 2GR, 2HN, 2IF, 2MH, 2JU, (2JZ), (2RK), 2SZ), (2TF), 2UC, (2XQ), (2XQ C.W. ,(2ZM, 2ACM, 3AA, (3BP), 3CL, (3DH), (3EN), (3GO), (3HJ), 3KM, (3VV), 3WV, 3XF, 3ZE, (3AHK), (4AG), 4AP, 4BY, (4XB C.W.), (4XC), 4YB, 5BI, 5ED, 3EJ, 4EL, 5ER, 5FD, 5FV, 5HL, (5XA), (5XB), 5YE, (5YH), (5ZA), 5ZG, 5ZP, (5ZL), (5ZU), (5ZZ), 6JD, 6JT, (6ZH), 7CC, 8AB, (8AY), 8BO, 8BP, 8BU, (8DC), 8DG, 8DJ, 8DV, (8FI), (8FT), 8GI, (8GW), (8GX), (8HA), (8HG), 8HI, 8HJ, (8IB), (8ID), (8IK), (8IN), (8IV), 8JF, (8JJ), 8KP, 8LB, (8LQ), (8LU), (8LV), 8MA, 8MF, (8MH), (8ML), 8MZ, 8NZ, 8OI, (8OJ), 8PM, 8PN, 8QJ, (8RQ), 8SP), 8TK, 8TN, (8VJ), 8XE, 8XH, (8XK), (8ZE), (8ZG), (8ZG C.W.), (8ZL), (8ZR), 8ZN, 8ZT, 8ZV, 8ZV C.W., (8ZW), (8ZW C.W.), (8ZY), (8ZZ), (8ADE), 8AAZ, 8AEE, 8AGO, 8AJW, (8AKV), 8ANK, 8ANO, 8ARK, 8CAS, 9AK, (9AP), (9BW), (9CA), (9CS), (9DP), 9DU, 9DV, (9EE), 9EK, (9EQ), 9EL), (9ET), 9FG, 9FN, 9FS, 9GC, (9GN), (9GP), 9HI, (9HM), (9HN), (9HT), (9HY), 9IF, (9JA), (9JN), (9JQ), (9JT), (9KL), (9KO), (9KV), 9LA, 9LF, (9LQ), (9LR), 9LW, 9MC, (9MH), 9NK, (9NQ), 9NS, (9OE), (9OS), (9OX), 9PC, 9PI, 9PJ, (9PL), 9QH, 9QO, 9RY, (9UH), 9UK, 9VL, 9VS, 9VZ, (9WE), (9WT), (9WU), 9XI, 9XI C.W., (9XM), 9XM C.W., 9XO, 9YA, 9YB, 9YI, 9YM, (9LW), (9YY), (9ZB), (9ZC), (9ZJ), (9ZL), (9ZQ), (9AAC), 9ABI, 9ABV, 9ACB, (9AEG), (9AEQ), (9AEY), 9AFV, (9AFX), (9AJI), (9AIG), (9AKC), 9AMN, 9ASF, 9ATL, (9AWK), 9AWZ, (NSF), (NAH C.W.), (WL2), (WWV), (XB1), (XF1).

(Continued on page 64.)

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9AHC ELLENDALE, N. D., January.

1IRJ QRA?, 2RK, Canadian 4BG, 5BI, 5BM, 5BR, 5CG, 5CI, 5DW, 5EF, 5EJ, 5ES, 5ER, 5EW, 5HL, 5HV, 5IF, 5IS, 5JA, 5JD, 5JS, 5JT, 5LC, 5LR, 5XA, 5XB, 5XD, 5YE, 5YH, 5ZA, 5ZC, 5ZF, 5ZS, 5ZT, 5ZL, 5ZX, 5ZZ, 6IG, 6JD, 6JT, 6PE, 6RE, 6ZA, 6ZG, 6ZH, 6ZM, 7BQ, 7CC, 7DH, 7EX, 7HS, 7IM, 7LU, 7YA, 7ZG, 8AB, 8BP, 8CF, 8CP, 8DC, 8DG, 9DP, 9DR, 8FA, 8FG, 8FI, 8FK, 8FT, 8GW, 8HG, 8ID, 8IK, 8IL, 8IV, 8IZ, 8JJ, 8KM, 8KP, 8LQ, 8LU, 8MZ, 8NZ, 8OZ, 8QJ, 8TK, 8VJ, 8XH, 8XK, 8XS, 8ZC, 8ZL, 8ZP, 8ZR, 8ZW, 8ZY, 8AAZ, 8ACF, 8ADE, 8AEE, 8AEY, 8AFB, 8AGB, 8AIB, 8AKV, 8ANP, 9AAC, 9AAO, 9AAR, 9AAV, 9AAW, 9ABB, 9ABH, 9ABL, 9ABX, 9ACB, 9ACD, 9ACL, 9ACN, 9AEG, 9AEJ, 9AEQ, 9AEY, 9AFO, 9AFQ, 9AFX, 9AGN, 9AGY, 9AGR, 9AHO, 9AHS, 9AHZ, 9AID, 9AIF, 9AIG, 9AIX, 9AIZ, 9AJN, 9AJS, 9AK, 9AKC, 9AKM, 9AKX, 9ALG, 9ALK, 9ALO, 9AMB, 9AMX, 9ANF, 9ANQ, 9AO, 9AOU, 9AP, 9AQI, 9ARC, 9ARZ, 9ASF, 9ASL, 9ASM, 9ATL, 9AUO, 9AUS, 9AVC, 9AVK, 9AWG, 9AWK, 9AWV, 9AWX, 9AWZ, 9AXJ, 9AXO, 9AXR, 9AXU, 9AY, 9AYE, 9AZ 9BP, 9BR, 9BW, 9CA, 9CC, 9CP, 9CS, 9DD, 9DE, 9DF, 9DH, 9DN, 9DO, 9EL, 9EQ, 9ET, 9EW, 9FA, 9FC, 9FG, 9FL, 9FN, 9FQ, 9FS, 9FT, 9GC, 9GK, 9GN, 9GP, 9GS, 9GX, 9HI, 9HM, 9HN, 9HT, 9HY, 9IF, 9II, 9IY, 9JB, 9JK, 9JL, 9JN, 9JQ, 9JT, 9JY, 9KB, 9KG, 9KI, 9KK, 9KL, 9KN, 9KO 9KR, 9KV, 9LC, 9LF, 9LG, 9LM, 9LN, 9LQ, 9LR, 9LW, 9LZ, 9MC, 9MH, 9MS, 9NC, 9NQ, 9NR, 9OB, 9OE, 9OO, 9OP, 9OR, 9OX, 9OY, 9PI, 9PN, 9PS, 9PV, 9QM, 9QO, 9RG, 9RV, 9RY, 9RZ, 9SC, 9SL, 9SQ, 9SV, 9SY, 9TF, 9TI, 9TO, 9TW, 9UG, 9UH, 9UK, 9UQ, 9UT, 9UU, 9VB, 9VC, 9VE, 9VJ, 9VR, 9VS, 9WE, 9WI, 9WJ, 9WR, 9WW, 9WZ, 9XI, 9XM, 9XT, 9YA, 9YC, 9YI, 9YM, 9YO, 9YW, 9YY, 9ZB, 9ZC, 9ZG, 9ZH, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZU, 9ZY, NSF.

9AGN, GRAND FORKS, N. DAK. Nov.—Jan.

2RK, 2SZ, 2XX C.W., 2ZL C.W., 4AI, 5BA, 5BI, 5CG, 5DO, 5DW, 5ED, 5ER, 5HL, 5HM, 5VE, 5YH, 5ZA, 5ZC, 5ZG, 5ZL, 5ZS, 5YM, 5HR, 5JS, 5XB, 5ZF, 5ZZ, 5ZW, 5YF, 6IG, 6KA, 6ZA, 7CC, 7DH, 7IM, 7HS, (7EX), (7ZG), 8AB, 8AY, 8BP, 8AF, 8DZ, 8EC, 8ED, 8EZ, 8FI, 8FK, 8FT, 8HA, 8HM, 8IK, 8IJ, 8JU, 8KF, 8LQ, 8MF, 8MZ, 8NI C.W., 8NQ, 8NZ, 8OJ, 8QJ, 8QQ, 8RK, 8UO, 8VJ, 8VS, 8WP C.W., 8ZK, 8ZC, 8XK C.W., 8XE, 8ZW. Too many nines. Canadian, (4AR).

9UH, NEWPORT, KY., January.

(1AE) 1AR C.W., 1AW, 1CK, 1CZ, 1GBT, 1HAA 1JAP, 1BBL, 1RZ, (2AR), (2AEF), (2AER), (2BK), (2DA), (2DN), (2DR), (2EL), (2JJ), (2JZ), (2OA), (2RB), (2RK), (2TF), (3AAE), (3AHK), (3BH), (3BC), 3CC, (3EN), (3GO), 3HG, (3HJ), 3HX), 3KM, (3PU), (3PS), (3UC), (3VV), (3NB), (3XF), 3YV, (3ZE), 3ZC, (4AG), (4AI), (4AU), (4CD), 4BK, (4BD), 4EK, (4XC), 4YA, 4YB, 5BI, (5DA), (5ER), (5FV), 5HL, 5JA. 5JD, 5JF, (5XA), 5XD, 5YE, (5YH), 5ZC, 5ZP, 5ZX, 5ZZ, (8AL), (8BC), (8BO), (8BP), (8DG), (8DR), (8DE), (8DV), 8FI, (8FK), 8GI, (8GW), 8HA, (8ID), 8IK, (8JF), (8JU), (8JJ), 8JE. (8KK), (8KM), (8KE), (8LB), (8LF), (8LH), 8LU), (8LX), (8LV), 8ML, (8MP), 8MZ, (8NI), (8NZ), (8OI), (8OJ), (8OM), (8PN), (8QJ), (8RQ), (8SP), (8UY), (8VJ), (8VQ), 8AAZ, (8AGK), (8AGO), (8AJW), (8ANK), (8XE), (8XH), 8XK, 8XS, (9AT), (9AW), 9BW, (9CA), (9CP). 9EQ. 9EL, (9FS), 9GN, 9GP, 9HI, (9HN), 9HT, 9JN, 9JL, 9JT, (9KL), 9KO, 9KV, 9LF, 9LQ, (9LM), 9LR, (9MH), (9MS), 9OE, (9OX), 9PV), (9UK), (9UU), (9VC). (9VW), 9WE, 9AAC, 9AAL, 9AAV, 9AAW, (9ABL), (9ACJ), 9AEG, 9AEQ. (9AFO), 9AFX, 9ARG, 9AWX, 9XM, 9XW, 9ZB, 9ZJ, (9ZN), 9ZL, 9ZQ. (NSF), (WL2), XF1, XF2.

CANADIAN 3DS, KITCHENER, ONTARIO, Nov. 14 to Jan. 15.

Canadian: 3AA. 3AB C.W., 3BP fone & C.W., 3CF, 3CY. 3DE, 3FO, 3FQ, 3KF (?).
Yankee: 1AW, 1BM, 1MO, 1OE, 1RU C.W., 1XD C.W. fone, 1XX fone. 1BAB, 1BBL, 1GBT, 1HAA, 1NAQ, 2AR, 2BB, 2BG, 2BK, 2CY, 2DA. 2JU, 2JZ, 2QR C.W., 2RK, 2SZ, 2TF, 2VA, 2WB, 2XJ fone, 2XX C.W., 2ZL C.W., 2ZM, 3BG, 3BH, 3BM, 3BZ, 3CC, 3EN, 3FB, 3GO, 3HJ, 3IW, 3KM, 3QW, 3UC, 3XF, 3ZW, 3ABD, 3ACS, 3AHK, NSF, WWV, 4DA, 4XB C.W., 4YB, 5BI, 5JD, 5ZA, 5ZZ, 8AA, 8AB, 8AP, 8CE, 8DI, 8DR, 8DV, 8DW, 8ED, 8EW, 8FI, 8FK, 8FM, 8FO, 8GB, 8GO, 8HA, 8HF, 8HJ, 8IB, 8JF, 8JJ, 8JS, 8JU, 8KC, 8KP, 8LB, 8LF, 8LN, 8ML, 8MM, 8MZ, 8NI spk. & C.W., 8NQ C.W., 8NZ, 8OY C.W., 8OZ, 8PQ, 8QJ, 8QM, 8QZ, 8RW, 8SH, 8SP, 8TT, 8VF, 8VG, 8WP, 8WV, 8WY, 8XB, 8XE, 8XH, 8XI, 8XK fone and C.W., 8XM, 8XU, 8YE, 8ZD, 8ZG spk. & C.W., 8ZL, 8ZR, 8ZV spk. & C.W., 8ZW, 8ZX, 8ZY, 8ZZ, 8ACF, 8AFB, 8AGZ 8AKA, 8AKV, 8AMB, 8AMJ, 8AMZ, 9AP, 9BQ, 9BW, 9EE, 9EQ, 9FN, 9HN, 9JQ, 9JN, 9KZ, 9LQ, 9MH, 9MS, 9RN, 9UH, 9UU, 9UX, 9YA, 9ZG, 9ZL, 9ZN, 9ZQ.

THE LOG OF AN AMATEUR AT SEA

(Concluded from page 28.)

9:00 p.m. 5ZA very QSA
12 5ZA very QSA calling CQ
10:00 No use copying all the local 6 stations; knocking off.

Dec. 30, 60 miles south Los Angeles.

9:00 p.m. Air full of 6's; cant get any DX thru them except 5ZA, who is very QSA
1:00 a.m. Knocking off—too much 6 stuff!

Jan. 4, 60 miles north Los Angeles. Pacific time.

7:46 p.m. 7AD talking to 7CW
53 5ZA very QSA
No 6's copied because too close.

Jan. 17, 75 miles up Columbia River, Oregon. Pacific time.

Only very long distance stations logged here.
8:34 p.m. 5ZA calling 6CO QRK
9:07 7CC calling 8KK very QSA
7KK very QSA also
7ZG QSA several times during evening
6JD QRK all evening
25 6VS signing off QRZ but readable.

THE RADIO LADIES

(Concluded from page 30.)

sister is liable to make in radio engineering and operation. We are minded of our experience at the Bureau of Standards in Washington recently. After finishing a Fading Conference, we attended one of the afternoon lectures given before the staff. We were struck by the number of ladies present, and as the subjects to be covered at the lecture were the magnetic exploration of steel bars for the determination of invisible defects and the measurements of the whip of great gun barrels, we wondered why the ladies. We asked if the learned gentlemen members of the staff dictated notes during lectures. The answer was, "No". Then we tackled from another slant. Were the ladies the secretaries of some of the distinguished scientists who made up the staff? Again, "No". Well, who were the ladies, anyway? Then we found that they were physicists, electrical engineers, chemical engineers, metallurgists, etc.

Draw your own conclusions, brothers, and watch out for sister, for she is coming. Let's welcome her. It will be lots more fun with her along.

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QST

A Magazine Devoted Exclusively to the WIRELESS AMATEUR



Organ of the American Radio Relay League

APRIL 1921 20¢

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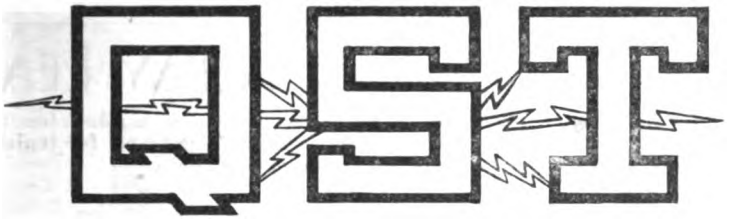
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The Official Organ of the A.R.R.L.

APRIL, 1921

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QST

A Magazine Devoted Exclusively to the Radio Amateur

The Spark Station Contest

THANK you, A.R.R.L. Men, for the gratifying response to our invitation to enter QST's Contest for practical spark articles. A goodly number of manuscripts were received and we are highly pleased in the feeling that the contest really succeeded in bringing out the kind of information we were looking for.

The judges found the studying of these manuscripts most interesting, but the determination of the winners rather difficult, for there was so much good in a number of them. Early in their study, all but seven of the articles were eliminated from serious consideration, but from there on much thought was required. It is now evident that we were a little inconsistent in choosing the title of our contest, for anything "ideal" straightway produces visions of Utopian conditions, whereas one of the main points was that the articles should be judged for their practical value in improving amateur operation.

WE, the Judges in QST's Ideal Relay Spark Transmitter Contest, hereby announce that it is our united judgment that the contestants named below submitted the best articles under the conditions and aims of the contest, and we award the prizes as follows:

First Prize
Mr. R. H. G. Mathews, 9ZN.

Second Prize
Mr. R. C. Denny, 6CS.

Third Prize
Mr. Sumner B. Young, 1AE.

Hiram Percy Maxim
F. H. Schnell
K. B. Warner

While we feel sure our readers will agree that the winning articles are excellent, none of them are perfect. Mr. Mathews', by receiving first prize, of course is voted nearest perfect, and indeed his article is filled with vital truths of amateur operation which make it a most valuable piece of amateur literature. Those principles which he advocates are ones which we ourselves have felt to be the best in amateur procedure. Mr. Denny's article, which will appear in QST soon, has a high value because of the very complete drawings and photographs accompanying it, making it of particular help to the man who "builds his own," and as such it surely merited a place among the prize-winners. Personally we do not agree with some of his likes and dislikes on the subject of transformers and voltages, nor do we feel that his aerial is an ideal one yet no amateur will read his article without resulting improvement in his own station. Mr. Young's article is almost purely an "experience story," describing his tribulations in making 1AE reach out, and altho the resulting good station is still far from anything we have in mind in speaking of an "ideal" spark transmitter, the manuscript must come in with the winners because of its "practical value in improving amateur operation"—the very splendid way in which the author describes how he discovered the defects in his set and went about remedying them will surely be of help to QST readers.

It will be seen that these three articles cover the ground from considerably varying angles. Careful study of them will do much to improve our stations, and we earnestly commend them to you. Mr. Mathews' article appears in this number, and the others will follow at intervals.

There was a certain unity of thought among many of the contestants, from which we can sum up the general sentiment as to what equipment the ideal station should have. The majority of the con-

(Concluded on page 11.)

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The Ideal Relay Spark Transmitter

By R. H. G. Mathews, 9ZN

——FIRST PRIZE WINNER IN QST'S CONTEST——

THIS description, despite the title, does not attempt to cover the "ideal" transmitter. Ideals must always compromise with fixed and sometimes unfortunately solid facts, and in this case many compromises have been necessary, partly with mechanical construction, with manufacturing convenience and with many other things which must be taken into consideration.

From the experience, somewhat costly at times, which the writer has acquired from past efforts at relay work, the set that follows has been evolved as the most logical and practical relay transmitter within the reach of the average radio amateur.

Since this transmitter is to operate on or near a 200 meter wave, this fact must be kept in mind as it will influence the design tremendously. The low voltage—high capacity sets commonly used commercially are absolutely useless for our purposes, because of their actual characteristics. Accordingly we must start right at our power lines and carry our design through to the top of our antenna. That point is the one most important fact to be kept foremost as we build our set. We cannot copy a navy transformer, a Marconi land station aerial and an amateur condenser and get the results we want. We *must* maintain consistent design *throughout* our set.

One of the most important factors in radio design, and unfortunately one of the most neglected, is that known as power factor. Power factor is that quantity in an alternating current circuit by which the products of volts and amperes must be multiplied to obtain watts. In other words, multipying 110 (volts) by the current does *not* give you your energy in watts in an a.c. circuit, contrary to a popular hallucination. The formula is as follows:

$W = E \times I \times f$, where f = power factor.

We know that both current and voltage rise and fall separately in sine curves in our a.c. circuit. When these two curves are "out of phase" 90 degrees, we have the condition shown in Fig. 1. This is the most ineffective and undesirable condition obtainable, and in this case the actual power is nothing although the current may be quite high. In Fig. 2 is shown the best condition, where power is at a maximum, since voltage and current are exactly "in phase". In this case the current in amperes may be no greater than before, and in fact may be *less* for considerably *greater* power in watts. In other words, current is no indication of power, unless your power factor is at a high value. This value can be regulated by the amount of capacity and inductance in your circuit, and this applies to every circuit in your radio set.

In order that we should not handicap ourselves at the start, the power factor

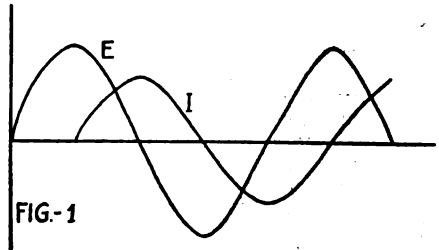


FIG.-1

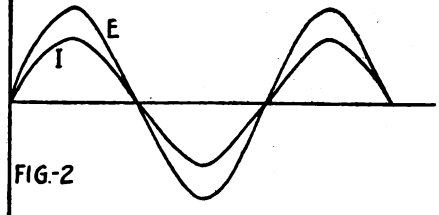


FIG.-2

of our power line should be as high as possible and the voltage drop over the leads as small as possible. The power factor can be kept at a comparatively high value by the installation of a special transformer and line and the voltage drop lowered by the use of heavy leads in the primary power circuit. A suggestion as to "blinking" lights may be in order here. Ordinarily the degree of this blinking is inversely proportional to the power factor. Now since power factor is always subject to regulation and is dependent on the inductance and capacity of the circuit in question, by correcting our power factor we can decrease the annoyance of flickering lights. Since inductance is almost always in preponderance in our power circuits, the connection of a large adjustable capacity as in Fig. 3 will bring the power factor to a better value, which will help solve our troubles with the neighbors. This capacity must be varied until the correct value is found, and may be as large as

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20 or 30 microfarads. Ordinarily paper telephone condensers are very satisfactory for this purpose.

To protect our power line against kick-back, as much of the wiring as possible should be contained in grounded metal conduit. Conduit wiring is the best preventer of kick-back troubles known, where these troubles come from induction between the power lines and the antenna circuit,

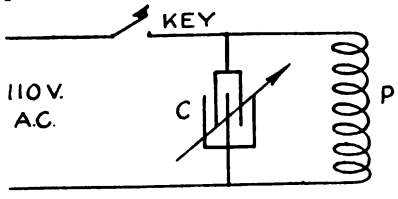


FIG 3

which is true in most instances. The connection of two resistance units in series across the line, with the center connection of the two grounded, is effective in eliminating such reaction as may occur in the transformer and will also help where conduit wiring is not possible. Sparks from steam radiators, etc., to other metallic objects may be eliminated by connecting all steam, gas and water pipes together in the basement at ten foot intervals with copper wire, soldering all connections and connecting all such wires to a good outside ground. This may sound like a reflection on water pipe grounds and it is fully intended as such; however, more on that later.

After our power line has been remodeled to suit our requirements we will pass on to the power transformer. Right here enters the old argument regarding high or low spark frequency. No attempt will be made to prove this point here, as this will be taken up in the paragraphs on gaps, but since this proof will show the low note to be superior, we will make that assumption here. Since we are to use a low spark frequency, a transformer of a type suitable for such spark frequency should be used. As a general statement, a transformer having comparatively great magnetic leakage should be employed with a low spark note. The old type United Wireless Co. "coffin" is very suitable for this reason and its performance under these conditions bears out this statement. Also, since our wave length is restricted, we cannot use a condenser capacity greater than .009 mf. and our transformer *must* therefore have a high secondary voltage. Unfortunately there is no really high voltage transformer on the amateur market today. Apparently transformer manufacturers are afraid to make them, either because of insulation troubles or because of prohibitive production cost. As a result no transformers are available with secondary voltage of over 25,000, which is not sufficient altho it can be used if nothing better can be procured. Again the old United Coffin steps to the front with its secondary voltage of 35,000. Many of us remember Mr. M. B. West's old pre-war station, 8AEZ. This station used a 40,000 volt transformer, while the writer used one of 43,000 at pre-war 9IK. With a high voltage—high leakage transformer and with our primary circuit power factor at as high a value as possible we are enabled to put something approaching our full 1 k.w. into the set, provided our condenser is correctly designed for our low note gap. In order to cover the point of power factor in the primary oscillating circuit, the condenser and primary inductance must be considered together. The gap will therefore be taken up next.

Although the quenched gap has been heard from to a considerable extent of late, the writer has never had much success with this gap on 60 cycle current, partly because of its delicate inductance adjustments which are thrown out by variations in current supply, and partly because of the low and rather wheezy note always obtained by the writer from such a gap, even when functioning properly. The quenched gap will therefore not be considered by the present author in connection with our "ideal set".

A straight gap is not worthy of much mention, of course, and this leaves us the rotary. The basis of nearly all argument in favor of a high spark frequency is founded on an antique and outgrown theory that the telephone is more sensitive to high frequency sounds than to those of lower pitch. This may have been true of the Indian-club shaped phones of our grandfathers and may be to a very small extent true of some modern phones but is certainly not the case with up-to-date mica diaphragm headphones, in which, if there is any preference, the low note has it. Our low note will also stand far more amplification on a regenerative receiver than a high tone, and with receivers of this type in use in practically every up-to-date amateur station this fact is of importance. It must be understood here that we are not speaking of high frequency quenched or synchronous rotary sets such as standard commercial 500 cycle transmitters. Our interest is in 60 cycle synchronous or non-synchronous sets.

Another antiquated argument which actual performance has disproved refers to the readability of signals through static and interference. A clear smooth low note can be read just as easily through interference of all kinds and as far as my personal inclinations are concerned, the low note is much more pleasant and easy to copy. Electrically, the argument is

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again in favor of the low spark note. Many operators have tried out the two types of gaps and have discarded the lower note because of higher indicated antenna current as shown on the aerial ammeter. There is no greater liar than the aerial ammeter and this is one instance of its habits of prevarication. A hot-wire or thermo-couple ammeter measures only the *average* current and *never* the maximum because of its dependence on heating values for its indications. Consequently a high note will nearly always show a greater indication on the meter, simply because the *number* of "humps" or discharges is greater, although the maximum energy in each "hump" may be far less than with the low note; *and it is always the maximum energy in each individual discharge that counts, and never the average.* It should also be evident that if we charge our condenser for a long space (comparatively) and then discharge it quickly, the energy per discharge will be far greater than if we charge and discharge rapidly. So much for spark frequency. In designing our gap to conform with these conditions we must also consider quenching. A gap which allowed the total energy of the condenser to discharge in one spark and then broke instantly, allowing of no reaction between aerial circuit and primary oscillating circuit, would be perfect. We cannot reach this perfection and so must content ourselves with something as near to it as possible. We have proved that we need a low note in our "ideal" set, but this most certainly does not bar high speed of rotation. Quenching depends largely on the speed with which we get our movable point past the stationary elec-

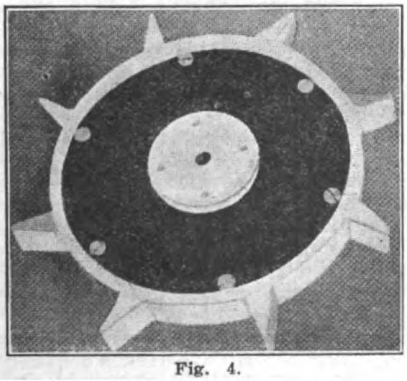


Fig. 4.

trode, so as to cut our discharge time to a minimum. To combine low note with high speed means that we must have a disc as large in diameter as convenient, to give peripheral speed, rotating at the highest safe speed with a small number of teeth. Our gap should have teeth narrow in the direction parallel with the face of the disc to cut our discharge time down further, and wide in the opposite plane, to reduce resistance at the time of discharge. The well-known thick saw-wheel disc with almost knife-edged teeth, having 6 to 8 points, rotating at 3500 r.p.m. and with a diameter of from nine to ten inches, is a good compromise between ideal theory and practical operating conditions. (Fig. 4.) Discs with round plugs having large surface area are obsolete and it is up to the users to convince the manufacturers of that fact. To further increase the quenching properties of our gap, metals having certain peculiar characteristics should be used. Tungsten points for both rotor and fixed electrodes are excellent, but since these are beyond the reach of most of us, we must look further. Experiment has shown that when an aluminum rotor is used with copper fixed electrodes certain inherent properties of these metals are brought out which greatly increase quenching under the heat of operating conditions. Brass is very poor and zinc is the worst metal which can be used on a rotary gap from this standpoint.

Heretofore we have been considering the non-synchronous gap. Exactly the same design may be followed with a synchronous gap. Synchronous motors rotating at 1800 r.p.m. are now available and either a four or an eight tooth wheel of the type described gives a low synchronous note which is exceptionally clear and agreeable to read. Greater efficiency is secured with the four point disc, since discharge occurs *only* at the maximum voltage. The eight point synchronous gap, giving the equivalent of a 120 cycle note, is more agreeable, and while the actual individual discharges are not as great, the efficiency is considerably greater than with any non-synchronous rotary and the strain on the transmitting condenser is less, which is of importance in constructing this condenser, to which our discussion has now brought us.

In condenser construction, mechanical strength and electrical efficiency must be combined properly in order to fit this important piece of transmitting apparatus for inclusion in our "ideal" set. A high voltage transformer naturally requires a condenser with a dielectric capable of standing that voltage, especially since the voltage in the condenser often builds up to a value four or five times the actual transformer potential. An oil immersed condenser or wax impregnated condenser is therefore a necessity in order to avoid excessive corona loss. For dielectric, plate glass or mica is excellent. There are on the market several varieties of transmitting condensers, but since the use of these with high voltage transformers requires a series-parallel connection, the cost is almost prohibitive. Accordingly we

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will describe a plate-glass, oil-immersed type, which has proven very satisfactory and has held up under the strain imposed by a four point synchronous gap with a 35,000 volt transformer.

Plate glass for our condenser does not need to be polished. Therefore, by getting rough or unpolished glass we can cut the price per plate down to forty cents. These sheets should be not less than ½" (one half inch) thick and can conveniently be one foot square. A metal tank of any type may be used large enough to hold the assembled condenser. Most of the trouble with blown condenser plates is not actual electrical break-down of the plates but is cracking, due to mechanical strain, followed by electrical break-down. This is especially true of the packed type of condenser. Because of the charges existing on the opposite sides of any plate a mechanical strain results in the fabric of the plate. When the plates are clamped together this strain becomes cumulative and as a result one or more of the brittle plates are cracked, following which a spark jumps through between the metallic surfaces. To avoid this difficulty, the plates should be placed edgewise in a wooden rack in the manner shown in Figure 5.

This, of course, necessitates the use of metal on both sides of each plate, and we have never found anything other than heavy tinfoil satisfactory for this purpose. This may be applied by heating each plate in an oven, rubbing beeswax over each side, placing the tinfoil sheets on the beeswax-covered plates and rubbing down with soft cloth to eliminate air bubbles. Before application the tin-foil sheets should be carefully rubbed smooth on a piece of glass to destroy all wrinkles. When glass one foot square is used, tinfoil *circles*, which may be cut round a plate 8" in diameter, should be used. This circular form, avoiding all sharp edges and points, solves considerable of the troubles due to brushing or corona discharge. With plates of this size between 30 and 40 are needed to obtain the capacity necessary for best results with the gap and transformer described hereinbefore. When the beeswax has hardened, shellac may be applied at the edge of the foil to prevent the dissolving of the wax by the oil after immersion.

After all the plates have been covered, they should be placed in the wooden rack mentioned before and leads brought out. These may be provided by pieces of thin spring brass 1" wide bent U-shape at the bottom. Such leads may be slipped down between each pair of plates, alternate leads being connected together. The assembly should then be immersed in a tank filled with the best insulating oil available. If regular transformer oil is not at hand, light automobile lubricating oil will serve, although, of course, it does not equal transformer oil in insulating qualities.

The construction of the condenser being completed, its adjustment must be taken up, but since this can only be done simultaneously with the primary inductance, we will consider briefly the construction of this inductance next.

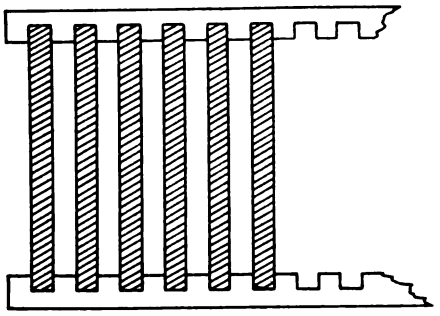


FIG. 5

The oscillation transformer primary is seldom given the proper amount of attention by the amateur constructor, and for that matter, by most manufacturers. The instantaneous current value in the primary oscillating circuit may reach a thousand amperes, but because of the momentary nature of this current, very little heating effect is noticed. Although heating does not result, the resistance effect of a small conductor in the primary is very noticeable on the efficiency of the transmitter. Accordingly, copper or brass ribbon two or three inches wide should be used, with clips to match, and the whole primary circuit should conform to this requirement. The pancake type of oscillation transformer is very convenient and is also the easiest to build. Provision should be made for variation of the coupling during transmission, as this adjustment can only be made intelligently under operating conditions. The secondary should not be made of less than 1" ribbon, and even heavier is desirable. In tuning our transmitter we will probably not use more than one turn of primary inductance and certainly not more than four turns. All above this should be removed to eliminate dead-end loss. The number of secondary turns is, of course, dependent on the characteristics of our aerial and therefore cannot be arbitrarily fixed.

With our transformer, gap, condenser and oscillation transformer completed we are now ready to tune our primary oscillating circuit, leaving our aerial and ground disconnected.

Before actually undertaking this tuning, however, a word on arrangement of the component parts of the set is in order. In

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order to transmit efficiently on our low wave we must not waste our small inductance value in long leads. The total length of leads in the primary oscillating circuit should not exceed 18". If the various instruments cannot be so placed as to allow of such short connections, we should run our pairs of leads, to the condenser for example, parallel and as close together as possible without sparking, in order to reduce the effective inductance. With a little study, instead of the haphazard thrown-together design of the average amateur transmitter, an arrangement may be evolved which is attractive in appearance and effective in operation.

In tuning this circuit, we not only must consider wave length but again we run up against power factor. In other words there are numerous relative values of capacity and inductance which will give the desired wave length, but only one of these various combinations which gives the highest power factor as well. It may be considered that our set consists of three circuits each complete in itself but linked with the others. We have already "tuned" our primary circuit. In tuning our primary oscillating circuit we must try to so adjust our capacity and inductance as to maintain "resonance" with the primary power circuit as well as the wave length desired. A watt meter connected in our primary power circuit indicates the power we are actually putting into our transmitter. If we now adjust our capacity and inductance, starting with the comparatively large inductance value of our full four turns, maintaining the wave length constant by means of a wavemeter, cutting down this inductance very gradually and increasing the capacity correspondingly, and if we note our watt meter reading for each of these adjustments, the point at which this reading is greatest is our correct adjustment. In some circuits the characteristics are such that this resonance point cannot be reached because of the fact that either capacity or inductance would be at an impossible value at the resonance point. In such cases the largest capacity which can be used, keeping the wavelength at the value desired, will be found best. In these instances, the primary inductance should be cut to one turn and capacity increased until the desired wave length is reached. This point is the best compromise toward the actual resonance point.

With this adjustment made, we are ready to couple on our secondary or antenna circuit. Before doing this some aerial and ground constructional data should be considered.

By consulting Zenneck we find that the effectivity of an aerial is dependent largely on the form factor and radiation resistance. Without entering into the mathematical proof of the matter, a vertical fan antenna has been found best for transmitting, with a flat-top T type runing a close second. A vertical fan aerial suitable for 200 meter work may be of the type and dimensions shown in Figure 6.

The vertical wires should be brought together at the lead-in insulator. A T type aerial 100 feet long and 50 feet high with four wires is also satisfactory for 200 meter work.

These aerials should, of course, be satisfactorily insulated and for our fan three 10½" Electrose insulators in series in each supporting cable (*not* in the aerial wires) should be used. Stranded copper or phosphor bronze wire, while very little

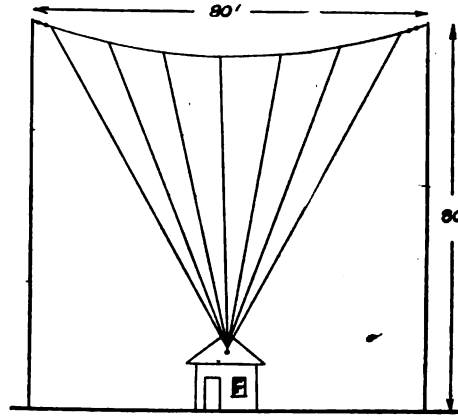


FIG 6

better electrically than solid wire, is considerably stronger mechanically and should be used if possible.

Our ground should be the next thing considered and here is where most of us fall down. A good ground is an absolute essential to a good transmitter and all our efforts to construct an efficient set have failed if we slip up here. An "outside" ground consisting of buried plates is excellent, when the plates have sufficient surface and are buried in moist earth. A contact ground of this type is not effective in dry ground or sand. For ordinary conditions a combination ground consisting of plates as well as wires radiating fan-wise from the station works very well. As much of this ground system as possible should lie directly beneath the antenna. If outside grounds are not available, water pipe connections may be used, but this type of ground is *never* desirable when any type of outside system can be installed. At 9ZN a composite system is used composed of six sheet iron plates, each 4' x 6', buried 6' deep end to end, in a semi-circle about the station, in addition to 50 wires varying in length from 50' to 150' buried at an average depth of 2 feet.

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A common mistake is made in connecting to a good outside ground and then, with the intention of making further improvement adding a high-resistance high-inductance ground such as a water pipe. The result is a decrease in radiation which cannot be corrected by re-tuning. The difficulty is that because of the different characteristics of the two grounds there is a phase difference between them and the resultant is less than the original. Ground connections with different characteristics should therefore be avoided. Counterpoise grounds are sometimes better than either of the types mentioned before, but since our ideal set is intended to operate under average conditions, we will not consider the counterpoise here. *

With our primary tuned and our aerial and ground ready, we will now tune our antenna to resonance. A hot-wire or, better yet, a thermo-couple ammeter should be connected in the ground lead and the secondary inductance varied till maximum antenna current is secured, keeping the coupling at not less than 4 inches. The secondary should then be pulled away from the primary as far as possible; the indication will then drop considerably. Holding the key down, the secondary should then be moved slowly toward the primary, the readings of the ground ammeter being watched closely.

The indicated current will gradually rise but will reach a point at which it remains constant for a small distance. Further coupling causes a rapid increase. *The point just before this second increase is the proper coupling adjustment.* We should not be deceived by this second increase. While it indicates current flow, it does not mean maximum current flow *on any one wave length.* In fact the energy radiated on the wave to which we are tuning is ordinarily much less than before this increase, even though the meter shows greater current. An hydraulic analogy of this may be found in the fire hose. Without a nozzle we get a great flow of water, but being scattered out over many different "waves" or one "broad wave" it gets nowhere. However if we put a nozzle on our fire hose we get a thin sharp stream corresponding to our sharp wave. Undoubtedly the "radiation" is not as great but it gets someplace since it is all on one sharp wave.

In one of our previous paragraphs we mentioned the three circuits evident in our radio transmitters. We have mentioned power factor in connection with two of these circuits but have not done so in connection with the antenna circuit. The idea of correcting our power factor from the power line clear through to the aerial is a new and novel one. No method of conveniently and intelligently adjusting the capacity and inductance of our aerial to correct the power factor is evident at the present time. Unquestionably such means will be found, but in the meantime we must satisfy ourselves with power factor correction in our first two circuits, merely tuning the aerial circuit to resonance in regard to wave length and decrement.

Many of the points emphasized in this article may seem of insignificant importance. Regarded alone they *are* unimportant, but a successful radio set can only be built by close attention to all such details, which taken together form the real essence of radio design. The difference between the long distance amateur and the operator of the 1 k.w. station which cannot work beyond his city limits lies primarily in the attention and study which the first has given to the correct design and coordination of the component parts of his equipment, and unless such attention and study is given, our unsuccessful 1 k.w. man never will be able to catch up with his more astute neighbor and likewise will always wonder why.

*We do not believe that the ground system described by Mr. Mathews is on a par with the remainder of his article. The "round ground" originated by Capt. H. W. Round and originally described in QST for February, 1919, is in our opinion the best ground system. It is expensive to install, but our "ideal" station should have it. Failing that we would recommend a symmetrical arrangement of buried wires radiating in all directions from the station to a distance at least 1½ times the height of the antenna.—Editor.

THE SPARK STATION CONTEST

(Concluded from page 5.)

testants agree on a vertical aerial, a buried radial ground system, a glass-plate oil immersed condenser of variable capacity, a high-voltage high-leakage transformer, synchronous 60-cycle gap, pancake oscillation transformer with very heavy ribbon; and they pay considerable attention to the adjustment of the closed circuit for best power factor. For receiving a separate single wire is advocated, running at right angles to the transmitting aerial, making break-in operation possible; and the receiving equipment in favor is a variometer regenerator with two stages of a.f. amplification. (Nobody suggested radio-frequency amplification, but with present tubes we suppose that is still a little too "ideal" for amateur work.) Some of the aerials described were altogether too long for 200-meter work and some of the O.T.'s were afflicted with too many turns, and probably these errors in constants account for some of the tunes we hear on the air these nights.

We are sorry that there could not be prizes for all the entrants. Many of the articles that did not win prizes are very good, especially on certain topics, and from these we shall publish excerpts from time to time, with due credit to the author.

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Converting Motors for Synchronous Gaps

By F. F. Hamilton, 9ZJ.

IT has long been the dream of citizen radio operators, that if only they could get a synchronous motor to run their gap everything would be about perfect. The great advantage of a synchronous discharge of a condenser over non-synchronous discharge is almost obvious. A synchronous discharge allows the condenser to be worked at a much higher average voltage. With a non-synchronous discharger there are times when the condenser is full of energy and cannot discharge anywhere except across the safety gap, because the gap electrodes do not happen to meet at just the proper instant. This we call the time-phase relation between the gap electrodes' meeting and the charging voltage to the condenser. The proper way to use a condenser is to discharge it at just the instant before it jumps the safety gap. This is working the condenser at its maximum working point. If there are one hundred and twenty maximum charging points of the condenser per second there should be one hundred and twenty meetings of the electrodes of the gap to discharge this condenser before the safety gap operates. Now if the gap electrodes are so adjusted that there can be two meetings per condenser charge we can discharge the condenser at half charge. This will give two hundred and forty discharges per second and is similiar to the synchronous gap tones heard almost any night. An eight electrode rotor is run at 1800 r.p.m. synchronous speed and the electrodes adjusted so that the charge of the condenser, which is one hundred and twenty times a second, is just evenly split in half. Under these conditions the condenser is worked at half charge, or fifty per cent of the maximum charge which would operate the safety gap at one discharge for each half cycle. Obviously the next thing to do is to raise the charging voltage of the condenser to twice its former value. This will then give the same power discharge as before, with a better tone.

Any induction motor of the squirrel-cage type may be easily converted into a synchronous motor. The writer has just completed five different ones, all operating differently, some on sixty cycle and some on two hundred. Some motors make better synchronous motors than others. This is due to the kind of iron used in the rotor.

A motor must have a proper winding for easy conversion into a synchronous motor. The best winding is one that gives definite pole magnetism with the greatest flux density at the center of the pole. In most standard motors this seems not to be the case and the rotor will hunt or slip back and forth in synchronism due to this fact; i.e., the pole strength is not at the center but on both sides of the center which makes the rotor rock, so to speak, back and forth. This will cause a wail in the gap tone.

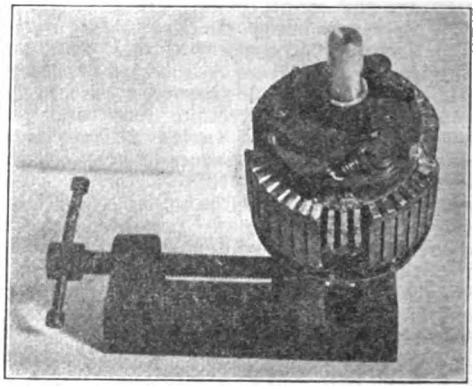


Fig. 1.

In an 1800 r.p.m. induction motor used on sixty cycle supply there are four poles on the stator. The wire is wound in slots. The best winding for conversion to a synchronous motor is where the winding is so wound in the slots as to leave one vacant slot per pole, which vacant slot is between the poles and not at the center of the pole area as is so often the case. This method of winding gives a decided four pole winding. If one slot is left open at the center of each pole area it should be filled with a piece of soft iron. Another way to construct the winding is to graduate the winding; i.e., put more turns near the center of the pole area and fewer in the outer slots. However, all this is not necessary to get a motor that will work in synchronism and handle an ordinary radio gap for one or two kilowatts of power.

On sixty cycle supply and 1800 r.p.m. synchronous speed there are four poles on the stator. These are alternate north and south around the stator at any instant. Each pole becomes north sixty times a second and south sixty times a second. This rapid reversal of magnetism induces in the rotor bars and iron a like change of polarity which opposes the poles of the stator. This causes the rotor to lock in position and give out a decided sixty cycle

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growl. To start the rotor revolving another winding is put on the stator called the starting winding. It is wound so its polarity is just between the running poles just described. The starting winding is not made to have near the strength of the running winding; it gives a weak pole just half way between the main poles. The poles then induced in the rotor by the running or strong winding are weakly attracted by the starting winding poles. As these weak poles are a few degrees around the stator from rotor's induced poles there is a weak pull on the rotor parallel with the direction of rotation. This weak pull starts the rotor to revolving and the rotor finally gets up some speed. As it speeds up there is another action that comes into prominence, due to the rotor bars cutting flux from the stator. This cutting of flux gives the rotor polarity which opposes the starting winding; therefore the starting winding is not needed after the rotor gets up some speed. Usually the starting winding is cut out by an automatic switch, at about two-thirds synchronous speed.

Now the power developed by the rotor is proportional to the amount of flux cut by the rotor bars and iron, to some extent. If the rotor is almost at synchronism there is very little torque being developed. When the motor is running idle the rotor will slip in and out of synchronism and can be detected by a slow changing of the hum given out by the motor. As load is applied the rotor slows down to the point where the fiux cut will develop enough torque to overcome the load.

Now to make this motor hold in synchronism. We have just said that the bars cut flux and result in a torque on the shaft. If the rotor is held in synchronism there will no cutting of flux by the bars and therefore no torque and the rotor slips out of synchronism in order to get enough

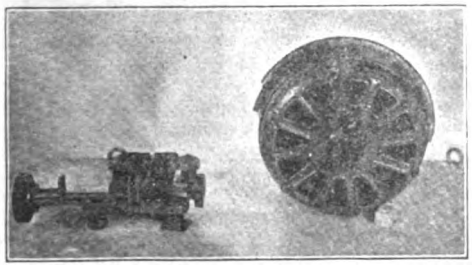


Fig. 2.

torque to overcome friction losses. Now the scheme is this. Remove the rotor from the motor frame and have four slots milled in the rotor about one quarter of an inch deep and five-eighths to three-quarters of an inch wide, on the quarters. See Fig. 1. Replace the rotor and immediately it will snap into synchronism and if enough counter torque is applied it will again run as a non-synchronous motor. The milled slots are milled out at the rate of one for each pole, six for a six-pole motor and two for a two-pole motor. Two-pole motors, however, don't work as well as four or six-pole. Running in synchronism, an entirely new action takes place in the rotor. Four definite or silent poles have been made on the rotor and thse poles want to run in synchronism with the rotating field of the stator. As was said before, the bars cut no flux and now should have no effect; this is not al-

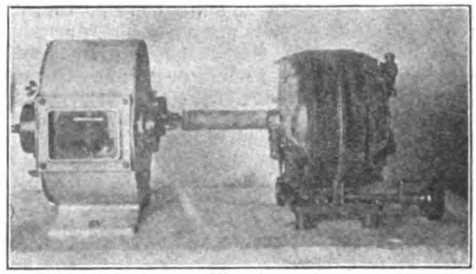


Fig. 3.

together true. The iron in the rotor now is practically the sole supporter of power for the rotor. The reluctance of the iron causes definite poles to be developed in the rotor. It can be seen readily that the more magnetism the rotor develops the greater the power in synchronism. Therefore for the best results, iron that has high reluctance must be used. In most cases the average motor will develop a little over half the power in synchronism that it does running non-synchronously before slotting. No general rule can be given for this, as different makes of motors differ.

Another feature develops, however. Sometimes the motor will not start, and one has to turn off the supply and turn the rotor a few degrees, whereupon it will start when the supply is again turned on. To obviate this difficulty the rotor is again taken out and copper put in the slots to replace the removed iron and copper. This will also cut down the windage losses. Now the rotor will start easily. This copper will also make the rotor hold into synchronism readily and cause the rotor to develop a little more power due to an opposing current flowing in these large bars, making more definite the polar regions on the rotor.

One experiment in which the motor was tried for synchronous speed with and without copper bars showed that it took twenty-five per cent less voltage to hold the motor in synchronism with the bars out than it did when they were in. This proves that the copper has some effect when the motor is running in synchronism.

Another feature developed: the motor

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will heat very badly because the iron is overworked. To overcome this a large amount of iron is necessary in the rotor for the amount of power desired. That is the reason why synchronous motors are so large for the power wanted. About a one-half H.P. frame is necessary to get proper cooling and power for a one-quarter H.P. motor. However, for the intermittent duty any old motor will do for a radio gap ordinarily requiring about one-sixth H.P. One can buy a cheap quarter H.P. single phase, split-phase-starting, induction motor for about twenty-five dollars and make himself a synchronous motor that will answer all purposes. One can even rewind the stator without much trouble and the knowledge gained thereby will be well worth the trouble.

Figs. 2 and 3 show a synchronous motor and method of attachment and adjustment for a gap whose stationary electrodes cannot be rocked. In order to get the condenser to discharge at the proper time the electrodes have to meet at the proper time. It is advisable to adjust electrodes for synchronism on low power, for it is easy to blow a condenser when adjusting a synchronous gap. To accomplish the adjustment with non-rocking stationary electrodes it is easiest to rotate the motor stator and frame in some manner as shown. Here the motor base has been slotted and a pinion with rack attached so as to give very close rotational adjustment to the stationary electrodes with reference to the movable electrodes and the peak of the charging voltage wave. Many other methods can be evolved by the industrious citizen radio enthusiast.

A Midnight Visit to T. O. M.'s

By Gilbert E. Mears

I HAD just about decided to close up shop for the evening when a high clear note busted in and nearly cracked the diaphrams on the cans. Wow! Hastily laying the fones on the table I grabbed a pencil and proceeded to copy. Whoever it was was calling me and signed off "OM." Shoving over my switch I answered and then waited developments. The msg was this:—"Cum over to my place right away. Address is—(I was sworn to secrecy on this point)—73 sig O.M."

Much mystified I put on my hat and coat and dashed down to crank up the old fliv. Proceeding to the address given I rang the doorbell and waited. With a buzz the door swung open and from the distance I heard a faint voice call, "Come on up." With a here-goes-nothing attitude I climbed the stairs and presently to my nostrils was wafted the odor of tobacco smoke, burned rubber and sulphur dioxide. Following the odor I came to a large room at the rear of the house. Peering in I saw a most wonderful collection of wireless junk, of a quantity and variety to make any ham's mouth water. At the table was seated a fellow in overalls who turned and beckoned to me to enter.

"Sit down and wait a minute. I just found a hole in the ether that I think I can shove a message through," he said.

Finding a convenient packing case in the middle of the floor I sank down upon it, not knowing what to expect next. Looking around in an awed manner I noticed that the room was literally crammed with wireless apparatus; all types and sizes of sending and receiving sets, cases half unpacked. and bits of wire strewn all over the floor.

Suddenly he ceased his mad pounding of the key and swung around to face me. I could hardly describe his face nor his



"Suddenly he swung around to face me."

build for I could barely see him through the haze of tobacco smoke, coming from the enormous pipe he had in his mouth. I did notice, however, that he was wearing large blue glasses.

"Well, young man I suppose you are wondering why I sent for you to come here tonight, and who I am and so forth. I am known as The Old Man and I send in a contribution to QST once in a while.

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This is my studio and workshop, and first of all I want you to swear that you will never reveal my address."

I solemnly swore that I would not and as I realized just who I was talking to, my mind began to travel at triple speed and I resolved that before I left I would ask SOME questions. I had just opened my mouth when he began to speak again.



" has a habit of staying out and talking to his friends.'"

"Now I sent for you because you happened to be close by here and from all I can find out by listening to your spark you have a *little* intelligence. No, don't thank me. I want you to do something for me. Ask the questions that you think any amateur would ask about me and I will try to answer them. Then you can write in to QST and maybe that will stop so many fool letters from reaching them about me."

"Wwwwhy do you wear those blue glasses?" I began timidly.

"To keep the glare from the audions from hurting my eyes. Next."

"Where is your cat? Can I see him?"

"'I just sent him to the drug store for some pipe cleaners. He probably won't be back before four o'clock as he has a habit of staying out and talking to his friends instead of paying attention to business, drat him."

"Is your CW set finished yet? I heard that you were going to build one."

"No, I am undecided whether to build one or not now. I find that nearly every ham in the U. S. A. is building such a set and just leave it to them. They'll have a decrement to CW before they are through. I know it, I feel it in my bones. I have a great hook-up for CW, though, and if I can get a license to send on 90,000 meters, I may try it out."

"Gee, let me have that hook-up, will you?"

"No, young man, it wouldn't do you any good. Only Marconi, Tesla and the Editor of QST could understand it."

"Don't you think that it is rather inconsistent to have that big sign up there, PEASE DO NOT SMOKE, when you are smoking that old pipe yourself?" I was growing bolder now.

"Oh that sign isn't for visitors, that is just a gentle hint to the motor generator on my telephone set, when I try to work the Pacific coast."

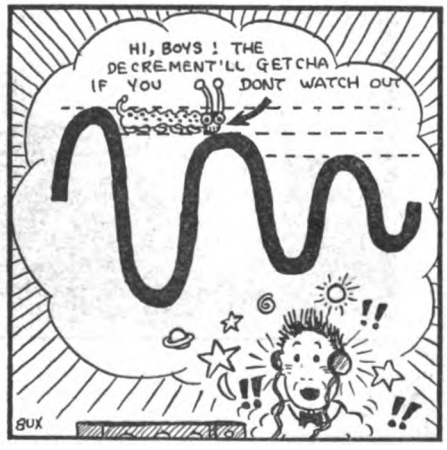
"Speaking of smoke, didn't I smell rubber when I came in here?"

"Most likely, I threw the eraser at the cat a short time before you came, and it landed on the quenched gap. I did not have time to take it off as I found a chance to get another one off the spindle at that moment." And he pointed at a huge spindle on his desk. It was about three feet high and was filled with messages.

"Did you get all those messages in the last few days?"

"Oh no," he said calmly, "I believe that the msg. on the bottom there is dated November, 1919. Some day before I die, I hope to have that spindle clean."

At this point we were interrupted. He spun around and began to pound the key again. I listened to the click of the key and heard him madly calling a seventh district station. The next moment he was telling ACX to "Pse QRT QRT ur decrement is rotten. R. I. will be after you." He listened intently and then with a howl tore off the receivers and strode up and



Editor's Note: We bet "ACX" knew what a "decrement" was art. after T.O.M. came back and explained!

down the room, tearing at his hair.

"Wow! Blankety dash blank blank!—Can you imagine that. He called me five times, signed off nine times, gave me a million R's and asked if he came in QSA

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now. And then he, he, he—"

"Yes, and then what?" I asked breathlessly.

"And then he said 'What is a decrement OM? I don't use one at this station.' "

I stood silent in the face of his fury. Quickly he crossed to the sending panel, removed the fuses and bridged them with No. 4 wire, shorted his transformer, and before I could stop him pressed the sending key. A roar filled the air, blue flames shot across the room, and with a terrible crash—

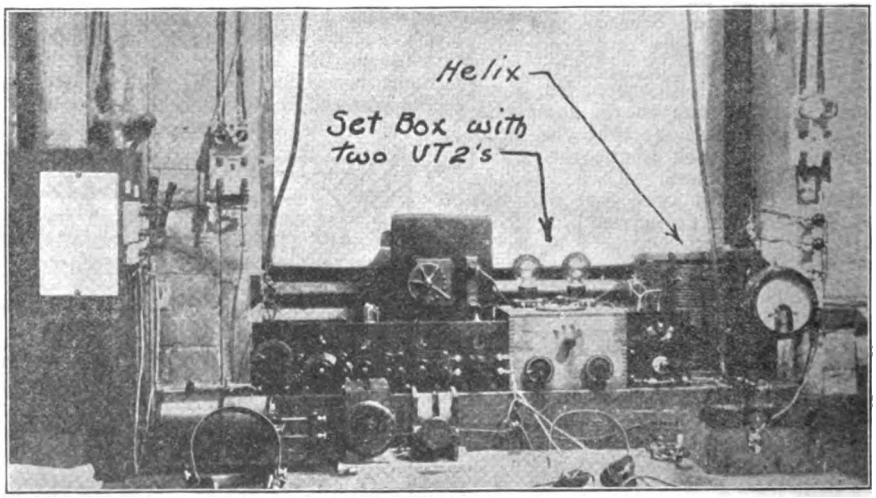
I picked myself up from the floor and rubbed the back of my head where it had hit the edge of the bed, and then unlimbered the old "mill" to write of my visit to the OM before I forgot it.

Here it is. Some nightmare. Do you think there is really any chance of ever meeting the OM under better conditions than that? I *would* like to see what he looks like.

Some Simple C. W. Sets

1XX, the Radio Club of Brown University, at Providence, R. I., has a little home-made C.W. set which has been heard at many places up to 900 miles distant and which is extremely simple in its construction.

This is an alternating current C.W. set, the plate supply being 600-volt 200-cycle, obtained from an 8-pole alternator by driving it at abnormal speed. The emission, then, is I.C.W., but probably best receiving results are received by heterodyning the signal.

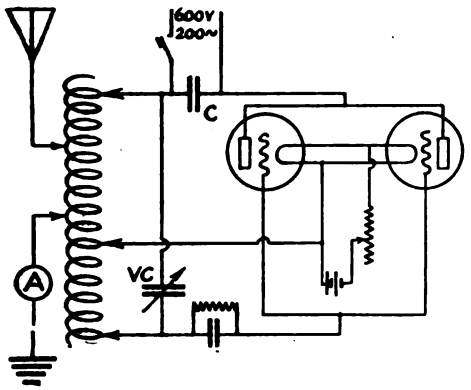


The aerial at 1XX is a flat-top T with a spreader in the center which is shorter than those at the ends, making it fan out and incidentally putting the capacity where it belongs. It is hung between a steel tower at one end and the ridge of one of the halls at Brown at the other, but unfortunately the snap-shots we have of the aerial and the generator are not good enough to reproduce.

The circuit is shown in the schematic diagram. The high voltage is connected across C, a ½ mfd. paper condenser. If this condenser be much larger it will draw a heavy current from the line, and ½ mfd. seems the best value. The helix is the ordinary type with edgewise-wound copper ribbon, about 8 in. in diameter. About ten turns are used. VC is an ordinary .001 mfd. maximum capacity air condenser. Two VT-2's (Western Electric 5-watt "E" tubes) are used in parallel, their filaments heated from an 8-volt storage battery. Mr. Learned of 1XX points out that it is necessary to be careful in using such tubes in parallel to make sure that the current paths to grid and to plates are the same for each tube, so that they may be sure to oscillate at the same frequency The grid condenser is an ordinary .0005 mfd. paper receiving condenser, and the grid leak a 5000-ohm graphite potentiometer segment. It would be better to bridge the leak from grid to filament than across the condenser as shown, since in its present position the high potential is still able to find its way to the grid thru the leak.

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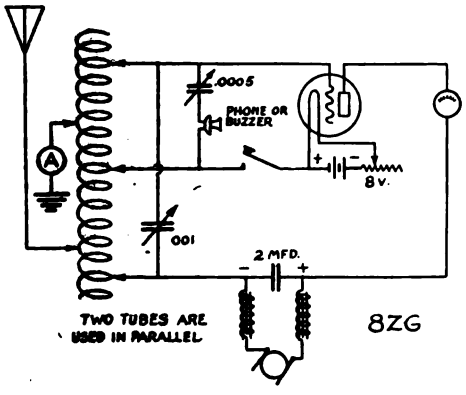
"E" tubes are rated at 375 volts but in a set like this where but one side of an alternating potential is used the tubes are idle approximately half of the time the key is pressed and of course cooling off all the time the key is up, so that a considerably higher potential may be used. However, if the helix is not adjusted correctly the variable condenser will break down



and the tubes will overheat, so in first adjusting it is best to use a lower potential, say 200 to 300 volts, and carefully watch the plates and grids and stop at once if they get red hot, as the VT-2's are not as rugged in this respect as the G.E. tubes. It is generally best to connect the antenna and ground clips to that portion of the helix forming the plate inductance rather than to the grid coil—the hookup shows the idea. The set will work on any wave length within the range of the inductances and capacities but greatest antenna current (1.5 to 2 amperes)is obtained with a wave length just a little higher than the fundamental of the antenna.

8ZG, Salem, Ohio.

8ZG is another of the 10-watt sets that has been doing phenomenal work. Rev. Manning's circuit will be seen to be almost identical with that of 1XX. The main inductance is a 28-turn helix of No. 6 copper

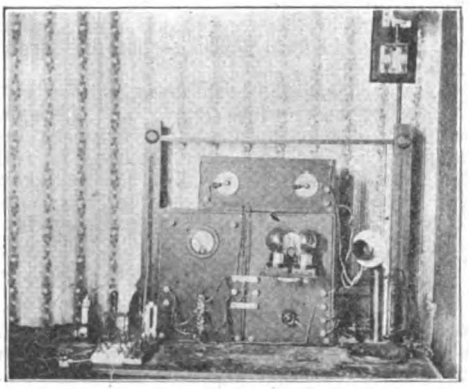


wire, 5 inches diameter, while the generator is an ⅛ h.p. 220 v. D.C. motor driven at 3000 r.p.m. and delivering about 400 volts. With two VT-2's, 8ZG has been heard in Portland, Me., and Port Arthur, Tex., 1060 miles, and is regularly handling traffic direct with New York City.

Such a set as this is simplicity itself, and with the photograph and the circuit diagram we do not see a thing more that might be said in explanation. We feel that such sets as this prove that anybody can build and operate a C. W. station with less fuss and more results than any other equipment.

7OD's Cigar-Box Set.

Recent mention has been made in the Operating Department's columns of the CW set of 7AD, F. J. Brott, in Seattle, which was kicking up quite a commotion in that territory. The queer thing about this set was that in spite of the noise it made it was completely contained within a cigar-box. Altho it has since slightly outgrown the c.b., it can still be put in one a little larger.

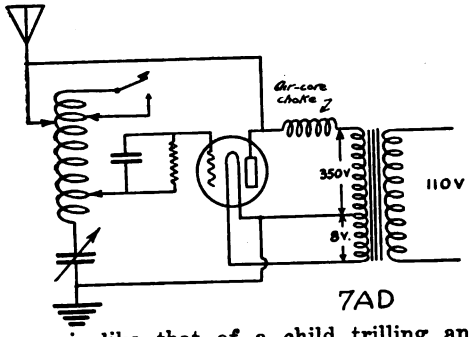


A snapshot of 8ZG.

Here we have the Colpitts circuit, with the plate supply secured by stepping up the 110 a c., and signaling done by compensated telegraphy. Only one tube is used, a VT-2. The small transformer is closed core of 1 in. cross-section, with 770 turns of No. 24 wire for the 110 volt side and 2450 turns of No. 30 to give 350 volts for the plate, and 56 turns of No. 19 to give 8 volts for the filament. The tuning coil is 3⅜ in. diameter wound with 40 turns of No. 14 D. C. C. shellaced, with two sliders that make contact with any desired turn. The ground condenser is a .0005 (max.) variable with the plates spaced a little wider than usual, while the grid condenser is fixed, consisting of two metal plates ⅝"x1¼" clamped tightly on either side of a piece of .005" mica. The choke coil is an L-750 honeycomb. The grid leak is a piece of red fibre 1" wide

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and 2" long with heavy pencil lines on it, the adjustment of the resistance value being very critical. The key shorts 3 turns on the unused end of the coil and gives a working wave 8 meters lower than the compensating wave. The antenna current is 0.46 amp. and the note, Mr. Brott



7AD

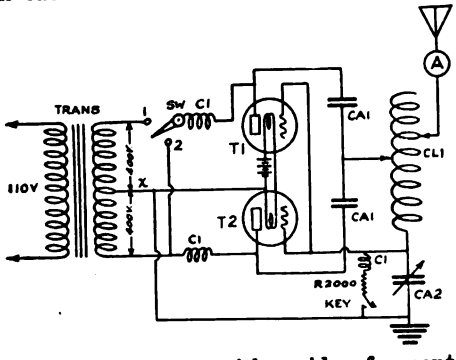
says, is like that of a child trilling and is pleasing to hear. The starting switch is arranged so that the filament is heated before the voltage is placed on the plate, which prevents the filament from "caking" and so shortening the tube life.

Signals from this set have been copied by 6OH at Ukiah, Calif., distance from 7AD 600 miles.

As a probable improvement on the circuit shown we would suggest that the grid leak should run from grid to filament instead of across the grid condenser, and the ground from filament should be taken from the center point of the filament-heating winding rather than from one terminal.

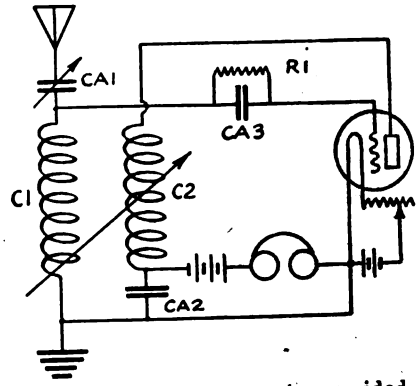
An A.C. Transmitter and a Receiver

Mr. Roy S. Copp of Dayton, Ohio, describes his C.W. set to us in the diagram herewith. This set also operates from stepped-up a.c., and uses one Marconi V.T. on each side of the cycle, the transformer



giving 400 volts on either side of a center tap. As here shown the set is designed for audio (non-oscillating) reception. The drawing is almost self-explanatory. Main inductance CL1 is 30 turns of No. 14 bare wire on a 4" diameter tube, spaced, with two sliders. The blocking condensers CA1 each consist of 20 sheets of mica 2"x4", with slightly smaller foils. (Any capacity above .002 mfd. that will stand the voltage will do.) The air-core chokes C1 are important, to prevent the r.f. backing up thru the transformer. They consist of 200 turns of No. 28 cotton or enamel-covered wire on a 2" spool. CA2 is an ordinary 43-plate variable and the grid leak for the set described is 2000 ohms, altho it would better be variable. Note that another C1 choke is inserted in series with the grid leak. This oscillating circuit is also the so-called Colpitts, and the arrangement is very similar to that described in the December QST.

The switch SW, on Point 1 utilizes a half of each cycle on each tube, while on Point 2 the tubes are paralleled and during one half-cycle both tubes function and during the succeeding half-cycle both are idle. Point 1 therefore gives a tone double that on Point 2. We wish to reiterate, however, that for non-oscillating



reception the arrangement provided by having the switch on Point 2 is much more satisfactory. The use of both halves of the cycle is superior, we consider, but not for audio reception. Its use is for heterodyne reception, since as explained on page 52 of February QST, the insertion of a choke in the center tap as at X will so flatten out the supply voltage that the output from the two half-cycles will overlap. That is our idea of how to do it—our idea, in fact, of the way to operate a C.W. set on A.C. Use this scheme of supplying voltage where there is a separate tube (or tubes in parallel) for each side of the cycle, and then introduce a large choke in the common lead so as to flatten the input wave to produce overlapping. Altho still modulated at the supply frequency to some extent, it will nevertheless heterodyne beautifully. It should be borne in mind that there will be a considerable voltage drop across an adequate iron-core

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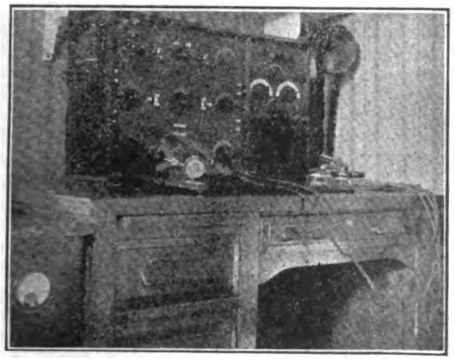
choke coil and the initial voltage across each side of the transformer should be made high enough to compensate for this. For an experimental set the secondary of the transformer could well be tapped to give various voltages.

The average regenerative receiver is hard to adjust to receive C.W. signals and so Mr. Copp gives us a description of his very simple regenerator which works with remarkable ease in heterodyne reception. The set described has a range of 175-600 meters, which of course could be increased by increasing C1 and taking off taps. C1 as used by Mr. Copp has 30 turns of No. 24 DCC wire on a 3½ in. tube, and C2 is of 30 turns of similar wire on a 3 in. form rotating within C1. C2 of course is a tickler. Tuning is accomplished by the 43-plate variable CA1, and aside from this there is but one adjustment—the tickler coupling. CA3 is the grid condenser and CA2 is a by-pass, in this case a duplicate of CA3.

The Amrad Transcons

ALONG about midnight when the DX owls climb on their perches and hoot, did you ever hear a message prefixed "AMT" come pounding through on that indefinable synchronous note? Mebbe you did and mebbe you didn't but whether you did or didn't the explanation of that innocent little 'gram is now running at large in every district. It seems that the Amrad people have been operating a little private transcontinental line all their own. And any message prefixed "AMT" travels only on the Quenched Gap Limited.

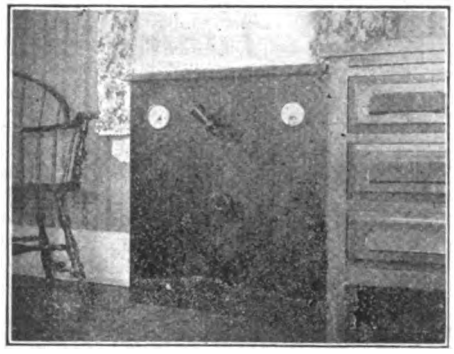
It wasn't that the Amrad Gap men caught a bad case of Transcon-fever during the A.R.R.L. relays; not that. They tell us that the first spikes on the Amrad Line were driven in last fall and it wasn't until the middle of February that the Limited was really fixed up and sent pounding across. Report has it that the first westbound Limited, scheduled to leave the Atlantic terminals on January 25th, never pulled out of the shack at 2PL. The



Operating Table at 2PL.

hostlers to receive her at Cleveland and Chicago were out on strike for more juice plus a bonus of 2 Dubilier Condensers for eight hours overtime. (They got the juice but still await the bonus.)

The Eastbound Quenched Gap Limited on January 25th fared better, pulling out of the Roebuck terminal at Santa Barbara on schedule time 12:30 P.S.T., taking water at Douglas, Ariz., and Roswell, N. M., before shrieking into Stromsberg, Nebraska, ten minutes later. Here the effects of a



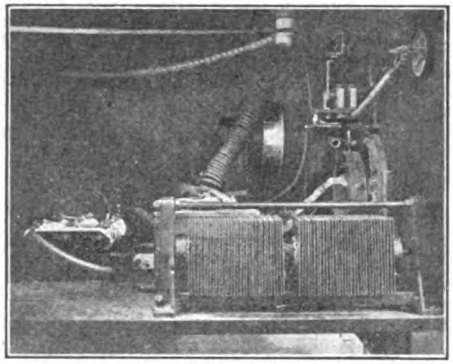
Transmitter Cabinet—2PL.

sympathetic strike were encountered, Nyquist's power being cut off for 20 minutes. 9AFX "hunted" for an eastern Amrad station but as none could be found gave the AMT to 9VA who passed to 8FT. Meanwhile, 2PL tore a hole into the West in search of the derailed East-bounder and after consulting 8KM and 9BP, switched to 8FT who forwarded the following messages from Roebuck at 6:10 a.m. E.S.T.—"Sixth district stations show higher audibility when using quenched gaps."

This ended the first run of the Amrad Quenched Gap Limited—towed into port by two rotaries after forging across two thirds of the continent in fast time. "Never again!" said the Eighth and Ninth District strikers, who hustled back to their keys without requesting an armistice. Nor did two heavy onslaughts of demon static coming on test nights Two and Three shake their determination to fire the Limited to the last pound of steam.

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On February 15th, at 2:00 a.m. E.S.T., 1XT, 2PL, 3VV, 8ML, 9PV, 9AFX, 5ZA, 6GI, 6DK and FD were dancing on their



2PL's Transmitter.

keys and between pauses in QRM conducted the three Quenched Gap Limiteds from ocean to ocean. 2PL passed the first Westbound AMT #15 to 9PV who passed to 9AFX, to 5ZA, to FD. The elapsed time was 28 minutes to be exact. 1XT passed also to 8ML who passed to 9PV. Coming East, the Limited travelled via 6GI, 5ZA, 9AFX, 9PV to 2PL, a second section stopping momentarily at 8ML, curious to know how he got that tone. Heavy drifts of static east of Chicago did not seem to impede the Limiteds in their course.

The Amrad Transcontinental Line having made its debut and won its spurs, will take its place in organized Citizen Radio. Additional stations are being appointed, branch routes are in process of formation, monthly Amrad tests are already scheduled and it would almost seem that a lusty grandchild has been born to the bearded A.R.R.L.

What will the Old Man do to his cat when he reads that half a dozen comparatively obscure spark stations boasting 60 foot aerials and 700 watts input, put over a transcon with quenched gaps under average QRM conditions?

Tuning Honeycomb Coils

By Anthony D'Amico, 2QW

AFTER reading Mr. A. Novice's article in the January QST calling for more information on honeycomb coils I decided to give to the amateurs through QST my data that I had collected after months of careful experimenting and sitting up late at night. The honeycomb coils manufactured to-day I must admit are very good indeed for long distance receiving on long wavelengths, but for amateur work or receiving on short waves I advise the user to bury them and use them as a ground, for they might be efficient as a ground.

I have read Mr. Groves' article in the March 1920 QST several times and I must give him very much credit for designing a receiver with which his marvelous results were obtained as he stated in his article on honeycomb coils.

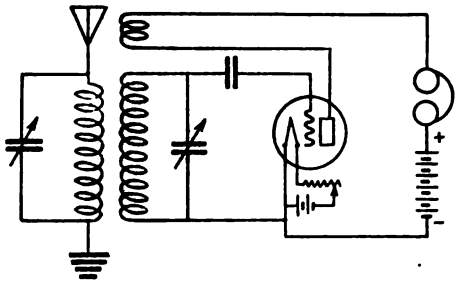
With the aid of my partner and coworker, Mr. Joseph Murray, I designed a simple receiver utilizing the tickler coil and using honey comb coils for tuning. We are not doing much transmitting here but we devote most of our spare time to receiving.

Our antenna is medium size, consisting of two wires 90 feet long and about 75

Station	Wave Length	Primary Condenser Reading	Secondary Condenser Reading	Primary Coupling	Tickler Coupling	Primary Coil, L	Secondary Coil, L	Tickler Coil, L
FL (1)	8000	20°	26°-27°	¾"	1½"	600	750	1000
NPM (2)	9500?	50°	40°	1¼"	4"-5"	400	750	1250
POZ (3)	6500?	48°	25°	1¼"	1"	400	750	1000
POZ (4)	12600	40°	18°-19°	1¼"	½"	750	1250	1000
BZR	5000	10°	3°-4°	¼"	very close	600	750	400
NAT	5500	22°	12°	1¼"	1¼"	600	750	400
NBA	7000	0°	28°	1½"	1¼"	600	750	400
NPL	9800	10°	10°	¾"	1¼"	750	1250	1000
NPL	9800	20°	62°	1¼"	4"-5"	400	750	1250
IDO	11000	0°	12°	1¼"	1"	750	1250	1000
LCM	12000	0°	21°	¾"	very close	750	1250	1000
YN	15500	0°	32°	2"	very close	1000	1250	600
NZR	11000?	40°	12°	¾"	½"	750	1250	1000
WSO	12000	40°	20°	¾"	1½"	750	1250	1000
NSS	16900	50°	52°	¾"	2"	750	1250	1000
LY	23410	60°	70°	¾"	very close	1250	1500	1000

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feet high, and is L shape. For tuning we use two .001 mfd. condensers, one in shunt with the primary coil and across the secondary. Rheostat, potentiometer, honeycomb coil mounting and a Moorhead tube complete the receiver. We have a two step amplifier which is used for amplifying weak signals. I will not go into further



details on the construction of the receiver as I have written this article especially for the amateurs who have gone astray on the use of the coils. With our one tube set we have copied NPM, a distance of approximately 6,500 miles, and all the European and American arcs, with ease and readable. We give below the circuit used by us and a list of the most important long wave stations we receive. We also show the primary and secondary condenser readings, the size coils, and the amount of couplings used.

It must be kept in mind that when receiving arc stations on long waves there are always two points on the secondary condenser where a station will be heard. I have given the reading where signals came in best and free from QRM.

I would like to hear from amateurs who make use of the above information.

Notes to Chart

(1) I found that using a larger tickler signals came in a little louder. FL works BUC (Budapest) between 7:30 and 8:30 p.m., 75th Meridian Time.

(2) NPM works NPN btween 2:30 and 3:00 a m.. 75th Meridian Time.

(3) POZ sends press in English on his 6500 meter wave. He can easily be distinguished, for when sending "px" he repeats each word.

(4) POZ sends all his traffic on his 12600 meter wave. Can be easily recognized by the following preambles—"Bln" for Berlin; "Dzg" for Danzig; "Bmn" for Bremen. For example: "rg 465 Bln, to WSO", etc.

QRM and The Relay Game

By J. F. Scholtes, 9AR

HERE it is again, the eternal subject of QRM and regulation of traffic. Fellows, this is getting to be a serious proposition and one which must be regulated in the very near future. Nowadays a fellow can hardly start to clear any traffic before 1 or 2 A.M., all because of QRM, most of which is unnecessary. Is it necessary to call DX stations ten or fifteen times without an interval? Or to call stations a thousand or more miles away when you know it is an impossiblity to carry on successful communication any length of time with him unless it happens to be 4 or 5 in the morning?

The following is an idea of perfect relay station operation The place: Chicago, because of its central location, and therefore one place where an outsider would think the worst QRM in the country must be experienced. The outsider does not know and seems you can't convince them that there is absolutely no local QRM after 10 P.M. I recently had an out-of-town radio man at the station about 11 P.M. one night and he remarked to me how quiet the air was and asked "where are all the Chicago radio men tonight? How is it that 9AU is the only one transmitting tonight?" When told that the rest were standing by waiting for 9AU to clear, he could hardly believe me. "How do you do it," he says; "out in the town I come from everybody transmits at once". "Yes", I said, "and hardly any of them ever clear any traffic". That's just what's wrong with most of the large cities in the United States—they simply have no co-operation among the local stations. Getting on the job in Chicago at say 10:30 P.M., what is heard—possibly a local station calling or working some DX station, and dozens of other stations in the first, second, third, fourth, fifth, eighth and ninth districts. Most of these stations have no traffic for relay; they are on mostly for pastime and enjoyment in establishing communication with a distant amateur, and thereby are causing quite a bit of QRM to stations who have traffic to relay. If we eliminated the stations that have no traffic, the relay stations would increase their efficiency at least 50%. Of course we do not want to eliminate these stations, but why can't we set aside special hours for the operation of stations who take no active part in relay work—say from 9 P.M. until 11 P M. for

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stations to experiment in distance work, no relay traffic to be handled, and after 11 P.M. for relay work **only**? Why not have a set of rules adopted as used in Chicago? These rules certainly have proved a great success for the regulation of local traffic why, then, cannot national traffic be regulated likewise? Wouldn't it help matter if we had two periods of DX hours—say from 9 until 11:30 P.M. first period, and from 11:30 P.M to 6 A.M. the second period, all stations working the first period being asked to QRX the second period and vice versa? This certainly will greatly help matters and reduce QRM in a great degree.

How about the "Chicago Plan", as it is called? Why not have a set of rules drawn up for the whole country with an A.R.R.L. Board as the Executive Council? You undoubtedly know of the great success of the Chicago Plan, and this system of local traffic regulation is being put into use in a large number of cities throughout the country. What was Chicago a year ago? QRM from morning until night, with hardly a chance to clear any traffic unless you sat up until 4 or 5 A.M.—and now? Local QRM is entirely eliminated, and I am not afraid to say that Chicago today has the finest organization of amateurs of any city in the world.

Now that the local QRM has been taken care of the question of DX QRM is before us. Considerable trouble is being experienced with QRM from DX stations. How are we going to eliminate this? A broad wave is one of the main causes of this QRM. Many who were at the St. Louis Convention heard a fine talk on the advantages of a sharp wave. Why not make your wave sharp? Is the primary of your oscillation transformer nailed to the secondary? Why not pull 'em apart? Even though your antenna current drops, it does not mean your range is less. You will be surprised at the results you will get using 8 to 12 inch coupling where you used to have only 3 or 4 inches (between pacakes).

Another thing we want to get rid of is the CQ signal. Is it necessary to send out a long string of CQ sigs. every night? Many a time while copying a msg. QRM will come in from one of those long drawn out CQ's. If it must be done, why not make it snappy? Also in calling another station don't keep on calling for five minutes at a stretch; give your transformer a chance to cool off.

Here is a question to think over fellows: What causes QRM? And here is an answer: Practically all QRM is caused by the operator not **thinking** before transmitting. Think it over, fellows. How many of you when sitting in some night hear a DX station call "CQ"? The minute this man puts the last dash on the "K", you start right in to call him, without **thinking** of the many things you should think of before going ahead. Many and many a time has QRM been caused by the failure of the operator to think properly before he starts to transmit.

Talking about conditions in general all over the country, I was handed a copy of a Baltimore local publication called "The Radio Condenser", and here are a few lines contained therein: "The Radio Condenser could be filled with articles on interfering, jamming, local QRM, etc., but what could we do and how far could we get? With the gang of local QRM hounds in Baltimore we could start nothing short of a baby revolution—bolsheviks over night." Is it that the fellows **do not want** the traffic regulated or is it lack of organization? In my opinion it is the latter. I can't see why any sane person should object to certain rules which would make local and DX conditions 100% better. Say you were in a city containing a hundred or more large amateur stations, and had no traffic rules, no organization, everyone transmitting at the same time, and no one doing anything but making a lot of noise. Would you prefer those conditions to that of a well-regulated city where even though there are a hundred stations each and every one of them gets his chance to work and no local QRM is caused?

Let's get the gang together; we have national organization in the A.R.R.L. why then cannot we have a National Executive Council, for the making and administration of national traffic rules for the amateur, the rules to be drawn up by the council, and to be rigidly enforced by A.R.R.L. men all over the country? This is a serious proposition and with the coming of hundreds of new men into the field day by day it must be handled carefully.

To Ships' Operators

The Bureau of Standards radio laboratory would like to receive from ships' operators, information as to signal fading and also as to "dead spots" at sea. The information to be valuable should state positions, time of day or night, wave length, strays, date; also, if possible, the particular station heard. General comments are, however, not out of order.

Some very excellent information of this type has been received from Mr. M. B. Lowe, formerly of the "Copponame" of the United Fruit Company, now of the "Ellis" of the same line.

The Bureau is particularly anxious to receive data on signal variations, etc., when both the transmitting and receiving stations are ships and there is no land within

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many miles of any point of the path traversed by the waves. There is practically no information available on radio transmission which is entirely unaffected by land conditions.

Letters should be addressed to "Radio Laboratory, Bureau of Standards, Washington, D. C."

April QSS Schedules

FOLLOWING is the transmitting schedule for the April Fading Tests, taking place every Tuesday and Thursday night on 200 meters, starting times being shown in Eastern Standard Time:

10:10 1AW Non-sync. spk.
10:20 3XF I.C.W. (Note 1)
NSF I.C.W. (Note 1)
10:30 9ZN 60-cyc. sync. (Note 2)
9ZN 500-cyc. quen. (Note 2)
10:40 9LQ 60-cyc. sync.
9ZJ 210-cyc. sync.

(Note 1: The I.C.W. of 3XF and NSF will differ in pitch and tone qualities. Note 2: 9ZN will operate two sets synchronously on the same wave, each having its own antenna.)

All stations are asked to co-operate by policing the air for absolute quiet during these tests. Remember, there is an observer near you.

Records

IN amateur history pre-war 2PM, New York City, is popularly credited with having been heard on three consecutive nights in Los Angeles shortly before we entered the war, but we have never been able to verify this. Pre-war 2AGJ at Albany is likewise credited with having been heard by a ship off Lower California, Mexico, probably a greater reach. Since the reopening numerous Central Division stations have worked ships off northern South America, but of course all such records fail before 2RK's Algeria and Pernambuco achievements. However, it is very interesting to note that in recent months many of our stations are getting out across distances right in our own country which are decidedly unusual. We do not believe that such records foretell the handling of relay traffic over vast jumps, but they are a commentary on our individual progress in transmitter and receiver efficiency.

Just to put it down in black and white for history to see, we wish to chronicle the following recent records which have come to our notice:

6EA, Los Angeles, heard by 2KF, Irvington, N. J., Jan. 4.

6ER, Los Angeles, heard by 8ZY, Defiance, O., during February.

6GO, Oakland, Cal., heard by 2KF, Irvington, N. J., Jan. 4.

6JD, Los Angeles, heard by 8ZL, St. Marys, O., Jan. 17.

6ZK, Sunnyvale, Cal., heard Jan. 15 by 8ZY, Defiance, O., and 2TT, New York City, and on Feb. 17 by 2KF, Irvington, N. J.

6ZR, Burlingame, Cal., heard by 8ANK, Pittsburgh, on Jan. 16, and by 8FQ, also Pittsburgh, on Jan. 29.

7CC, Moscow, Ida., heard at 8ZY during February.

7ZJ, Vancouver, Wash., heard at 8ZY during January.

8XS, Lansing, Mich., copied by 6AK, Walnut Grove, Cal., Jan. 20.

8ZR, Mansfield, O., copied Jan. 19 and Feb. 24, respectively, by 6EJ and 6AK of Walnut Grove, Cal., and on Feb. 12 by 7ZJ, Vancouver, Wash.

8ZS Wilkes-Barre, Pa., reported Jan. 18 at 6AK, Walnut Grove.

9EL, Council Grove, Kan., copied Jan. 27 at 6EC, Anaheim, Cal., on one bulb and aerial 25 ft. high.

9ZJ, Indianapolis, copied on QSS test by 6AK, Walnut Grove, Jan. 27.

Old Loose-Couplers as Regenerative and Autodyne Receivers

By R. R. Ramsey.

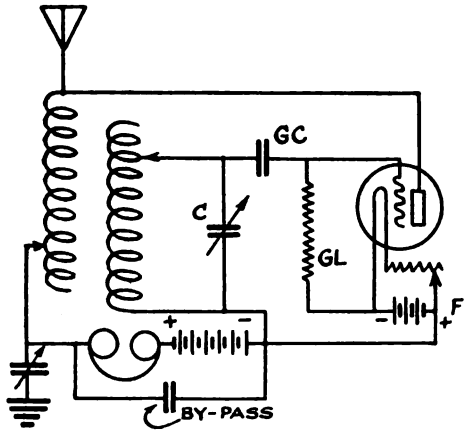
PERHAPS it may be of interest to those who have old apparatus and who do not have the time to build or the money to buy more modern receivers, to call attention to the fact that the old fashioned two coil slide tuners can very readily be used with a bulb as a regenerative receiver, as an oscillator, and therefore as a self-heterodyne receiver for C.W. telegraphy and wireless telephone. The accompanying sketch will show the connections.

"Pri" and "Sec" are the primary and secondary coils, respectively, of the "loose-coupler." The terminals of the secondary are connected to a variable condenser, C. One side of this condenser is connected to the grid terminal of the tube. A grid condenser G.C. may well be inserted, with the grid leak, GR. The other side of the variable condenser is connected to the filament of the tube at F. The negative terminal of the B battery is also connected to the filament at F. The positive terminal of the B battery is connected thru the telephones to one terminal of the primary coil, (ground terminal, say) and the antennae terminal of the coil is connected to the plate of the tube. A by-pass condenser is placed around the telephones and B battery.

The primary coil is made to do double duty, both as primary coil proper and as

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"feed back" coil. The connections must be made so that when the current in the



secondary coil runs towards the grid of the tube, or rotates clockwise in the secondary coil, the increased current of the plate circuit will rotate anti-clockwise in the primary coil. The right connections are determined by experiment. If the tube will not oscillate, interchange the connections to the primary coil so as to reverse the direction of the current through the primary coil. The circuit oscillates best when the primary and secondary circuits are tuned to the same wave length. The degree of coupling can be determined by experiment.

While using a home made coupler, maximum wave length 1500 meters, and two tubes, I have heard at Indiana University 2XJ phone and a conversation between 2HKI and KQO, all three phones being very distinct.

A Chance To Help Your A.R.R.L.

Fellows, this A.R.R.L. of ours is going to raise forty five hundred dollars in hard, cold cash by May 1st to pay off the bonds that were sold to get our QST started two years ago. We've got a good-sized chunk of it in hand right now of course, and we're asking our advertisers and newsdealers to help us by paying up their bills promptly, but it's going to be a pull and we want you to help. If every member of the A.R.R.L. will get just one radio bug who is not a member to join the League, the ready money that will come in will do the business at once.

So the general order for the first half of April is "Every member get a member." Your quota is **one.** Will you go out and nail that neighbor of yours for the A.R.R.L. and send in his application on the blank below? It will be a big help that will be much appreciated.

If you purchase QST on the newsstand and aren't a member of the League, send in the blank and join, and QST will come to your home every month.

USE THIS COUPON

American Radio Relay League,
Hartford, Conn.

For my quota in the A.R.R.L. April Drive I enclose $2.00 for which please enter for membership (including QST) for one year.

.....

(Name) **(Street or Box)** **(City and State)**

Secured by.....

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EDITORIALS
de AMERICAN RADIO RELAY LEAGUE



Help the Cops.

IN several cities, notably New York, Dallas and St. Louis, information is being broadcasted nightly concerning stolen automobiles, and surrounding amateurs are earnestly requested to aid the scheme by copying the data and transmitting it to their local Chief of Police. We told about this in our February issue, and since then the transmitting stations in these cities have been banging 'em out every night. Are you doing your part to make this idea a success? The effort will be small and if we deliver good snappy service on this thing we will bring Citizen Radio further into public appreciation.

In New York in particular we have an opportunity to make an impression. There the police's own station, KUVS, sends out the broadcasts at 7:30 and 11:30 nightly on 400 meters. The police in all the surrounding towns have already been advised to watch out for reports coming via Amateur Radio, and they are waiting—patiently. Some evening one of these Gotham stick-me-up's is going to rake in a bushel or so of diamonds that don't belong to him and depart in a westerly direction in somebody else's chariot. Then the alarm will go out, and if Amateur Radio can do its part, the cops will be thick as flies in every surrounding town, and our friend will be picked up before he gets very far. There will be a little personal glory in this too, if that counts. Will you be the one? Help the cops.

Going Down!

HOW'S your wave length by now? Do you wish we would stop talking about it? We'd like to, but really we can't as long as the situation remains as serious as it is. Although 3DH is still the outstanding example of how long a wave not to have, many stations have succeeded in dropping theirs, and things look much better. 1XM and 2RK are actually moving traffic on schedule between New York and Boston on waves of 199 and 209 meters, respectively, where QRM on the average amateur tune of around 240 makes it impossible—nobody else home on 200.

Who is it so busy these days logging amateur wave lengths? Somebody is, and on some eventful day of days that little bit of information, including the logs that every Navy station keeps, will be read into the record as evidence of how we amateurs obey the law. It will be the truth probably, and there's just one way to offset it: get busy right now and between this day and that, whenever it may come, get all our waves down where they belong so that we can present a clean front on the day of judgment.

Do your part—get down yourself.

Conventions.

WE are in an era of radio conventions. One who has been unable to attend one can not appreciate how fine a thing they are. There is nothing that so spreads the cement of fellowship as getting together with the bunch and meeting personally the men you have known only by their sparks. There's not a one of us without dozens of friends made thru the air, and we tell you that it is certainly a pleasant feeling to meet these chaps face to face. So let's have more conventions, and more. They are fine.

And don't forget the big national one in Chicago this coming fall—the First National Convention of the A.R.R.L., our dream of years. We'll be there from every state in the Union, and it will be worth a year of your life to attend. Detailed announcements will appear soon in QST—save your money.

QRX for QSS Tests.

THE fourth and final series of Bureau of Standards—A.R.R.L. Fading Tests will be held on the Tuesday and Thursday nights of the month of April, beginning at 10 p.m. E.S.T. and lasting a little over an hour. We again request all our friends east of the Rockies to stand by during these periods in order that the important data can be logged for study. There are observers within your QRM range, and your transmission will surely "bust" them, so we ask that you keep your transmitters silent during these periods.

During the January tests there were several instances where records were spoiled but it always turned out that

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the interference was unintentional, the "offenders" either not knowing or forgetting that QSS Tests were going on. So pass on the word, fellows, and let's have a perfect score for our Bureau this time.

The January tests were very successful, several new kinks being introduced. The most important was the division of the recorders into two groups, with the transmitters sending synchronously in pairs on different wave lengths, each group of recorders copying a particular station. This gave records on simultaneous fading on different wave lengths, a feature not covered by the earlier tests. In the coming series the two-group scheme will be used again, but this time the transmissions will probably be on about the same wave, tone variations being depended on for reading. And it is expected that a real 200-meter wave will be used. (Take a good look at it, some of you!)

The records secured in these tests are being analyzed by the Bureau of Standards and each series covers certain new angles of the problem brought to light by study. When the work is completed we can expect that the Bureau can tell us (and incidentally the world at large, for the whole scientific world is watching us) just what makes our signals fade. We are doing a good piece of scientific work, and we are proud that we can assist the Bureau. Let that knowledge be your compensation while you QRX for the April Tests. We thank you.

The Third District.

A NOTABLE piece of amateur business was accomplished at the Philadelphia Convention in the adoption of a plan for organizing the district to secure effective co-operation among the various interests. It was our pleasure to be present at the discussions leading up to the adoption of the plan and from the admirable spirit of co-operation shown by everyone we are confident of the success on the plan. In addition to purely amateur matters such as a division of hours, it will provide for the appointment of certain good amateurs to act as Deputy Radio Inspectors, assisting the Department of Commerce in the enforcement of the laws. This is a duty which we amateurs have long volunteered to undertake and by which we feel that we have much to gain. The institution of such arrangements in the Third District amounts to a trial of the scheme, and if it is successful we may expect that it will be taken up in the other inspection districts. We therefore urge good A.R.R.L. men thruout the district to give the plan their heartiest support when it comes up for action in their territory.

Our Goat.

EVERY now and again somebody says something that gets our goat. It happened again the other evening when a poor benighted creature disclosed the appalling fact that he had never heard of our A.R.R.L. He did not know that amateur wireless was anything but a toy for a few boys in short trousers. He had heard of George Washington, Napoleon Bonaparte, Mr. Marconi and Al Jolson, strange to relate, but he had not the slightest notion that private citizens were communicating with each other across the country by means of amateur radio. Our great Trans-Continental Relay was seriously doubted by him, and when we got hot and made him listen to the whole story of A.R.R.L. he was amazed, and wondered why the newspapers did not mention such wonderful things.

We do not appreciate what big things we are doing, fellows. It requires an experience like the one mentioned above to thrust it home upon us. That Trans-Con was a mighty big thing. Not only was it a most wonderful thing to have sent several messages across the continent and had the answers back in from six and one-half to twenty-three minutes, but it was also a very wonderful piece of organization work. Just think of what we did that eventful night! It seems hard to believe. All of you fellows co-operated and stood by while the few stations selected to do the job went ahead in clear air and put it over. Think of getting clear air all the way from Hartford to San Francisco and Los Angeles! But that was what we had. It was simply thrilling, that night, to sit in and realize that 1AW was talking with 9ZN, just as though he were on the other side of town, and that 9ZN was doing the same with 5ZA at Roswell, New Mexico, and that the latter was doing likewise with 6ZK and 6JD on the Pacific Coast. Schnell was at the key at 1AW and before he started the messages he wanted to know positively that each station was QRV all the way across. Matty at 9ZN was heard to ask a few fellows to please QRX for the Trans-Cons and we heard each fellow say "OK OM will QRX". We could not read 5ZA, although we could hear him at 1AW, and he evidently was doing the same. On the Coast they were doing likewise, probably, for in a few minutes Matty came back in his nervous staccato, "OK QRV all the way across OM SHOOT". Schnell shot a smile at the writer and Mr. Maxim and let the first one go. Matty gave a snappy "R" and immediately was slamming it to 5ZA. Not a sound disturbed the ether during this and the messages which followed, and we

(Concluded on page 47)

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The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



A GRAND total of 9793 messages is *reported* for this month, but there are many hundreds of stations that have not sent in their reports. New York City with its great number of amateur stations is not among those present, and we feel more than confident that this city alone has handled at least a thousand messages which should be included in our report. Efforts to have the New York amateurs turn in their reports seem futile. Perhaps they are so busy handling traffic that they have no time to make out reports. For the third time in succession the honor position goes to a Central Division Amateur for handling the greatest number of messages, and reporting them.

MR. J. W. KAUFFMAN
8IK—Central Division
302 Messages.

C.W.

C.W. is already playing the part that was predicted for it. When spark stations fail to come thru the QRN, the C.W. stations are moving traffic without very much difficulty. One of the most reliable routes we have from Boston to the west is via 1AE, 2ZL, 8ZV, 9XI, and 8ZG. After traffic reaches the middle west, it is further distributed via 9XM, 9ZN, 9PQ, 9XZ and 9ZB. 2ZL is probably the most powerful of the C.W. stations and works to the south and southwest with ease, while our sparks struggle along thru the QRM.

Results are so promising that the time is here when we must have C.W. transcontinental routes. Accordingly, we earnestly request information on C.W. stations who desire appointments for this work. Apparently this will be our solution for summer relaying. Here is an opportunity for you if you have a C.W. station. Many of you will doubt the consistency of these C.W. stations, but it is only because you do not listen for them. Spare the spark for an evening and listen in about 9:30 p.m. E.S.T. and be convinced. Do not forget that it is necessary to have your tubes in the receiver oscillating to achieve results.

Alaskan Division.

For the first time in a long while we have a report from the Alaskan Division. Surely there are stations in Alaska that will eventually handle traffic from the States. We appeal to those amateurs in Alaska to communicate with their division manager, Roy Anderson, Box 206, Ketchikan. Mr. Anderson has some very interesting news for you.

The reports follow:

ATLANTIC DIVISION.
C. H. Stewart, Mgr.

Regret to advise that again no report has been received from the Northern Section (N.Y. and N.J.) except that a carbon copy of report of Dist. Supt. Southern Jersey has reached the Division Manager, and is herein incorporated. This state of affairs is one that cannot continue to exist, and must be corrected, and with that end in view will receive the early attention of the Division Manager.

Mr. M. Frye, Dist. Supt. Southern Jersey, reports that traffic is being handled in his District in better shape that at any time during the past year. Branch Line "A" (Philadelphia to Shore resorts) is in active daylight operation. A number of new and efficient stations are in operation, and almost without exception the older stations have greatly improved in efficiency and reliability. Traffic from Atlantic City and Shore resorts is delivered in Philadelphia almost invariably within 24 hours.

The following official stations have been appointed:
3FB—Wm. Jordan, Atlantic City, N.J.
3EH—Messrs. Phillips and Densham, Collingswood, N.J.
and these stations have done very excellent work during the past month.

The total traffic handled by League stations in this District was approximately 225 messages. The following stations are worthy of mention for having done excellent relay work: 3ACM, 3EH, 3AAN, 3BA, 3FB and 3NB.

Daylight communication has been established by several stations in this District with Wilmington, Del. Tests have been

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carried on by the station of the Dist. Supt. to establish daylight communication with stations in Central Pennsylvania and Southern N. Y., but to date no consistent connection has been made, although several stations have reported hearing the test signals and likewise several stations have been heard at the station of the Dist. Supt.

Report received from the Western Pennsylvania District shows that the following stations have been added to operating personnel since the last report was made, viz: 8ACF—Washington, Pa.; 8PN and 8HY—Vandergrift, Pa.; 8VG—Freeport, Pa., and 8HA at New Castle, Pa. The latter station has broken the long distance record for official stations in this District.

Stations 8DV and 8RQ were out of operation the larger part of the last thirty day period. Altho 8RQ handled 138 messages last month most of which were between 300 and 800 miles. Mr. Carson connects up with Chicago—Boston—New York—Washington—and Toronto Canada, mostly thru 9UH and 8FT. 8MT at Uniontown, Pa., has not been heard for several weeks. All other stations in this District are handling traffic regularly. At Washington, Pa., 8JQ is again on the job and is working DX regularly.

After many months of waiting we have at last hooked up with a station between this District and Central Penna. Headquarters, namely, 8XE, State College, Pa., with whom several of our stations have been working night, though experiencing bad fading, which was the same trouble which was had with signals from 8BQ and 3ABD. On account of this fading 8XE works western traffic through 8WY at Cambridge Springs, Pa., and Pittsburgh traffic is then passed down Trunk Line No. 2. 8WY is handling north-bound traffic to Cleveland and Buffalo regularly, thus affording a reliable connection between Trunk Lines "A" and "B" A few more good stations north of 8WY or north of 8HA (New Castle, Pa.) could be used to good advantage, and stations capable of handling traffic are requested to communicate with the Dist. Supt.

Reports of messages handled are meagre, but 8ZD reports 182.

District Supt. Central Penna., Mr. H. M. Walleze, Milton, Pa., gives a very clear idea of the conditions in his District. 3ABD is getting in trim for real work, having been forced to relocate his station several times. 8BQ, the station of the Dist. Supt. at Milton, Pa., hopes to be able to reach out. Operator Rile of 8XE has been doing some excellent work, and has recently handled a great deal of traffic in all directions except to the south, in which direction he seems to have trouble, although he has been able to connect up with 3EN at Norfolk on numerous occasions. It is important that a station be lined up between 8ZD (Pittsburgh) and 8XE, as the fading conditions in this section of Penna. are peculiarly bad. The necessity of such intermediate stations is emphasized by the fact that on account of State College being closed during the summer months it will be hard to keep Trunk Line "B" open during the summer over the distance between Milton and Pittsburgh on account of the fading conditions. mentioned. Good reliable stations are needed in both Harrisburg and Sunbury, Pa., particularly for the purpose of connecting up to the Northern and Southern routes of Trunk Line "B" which it has all along been the intention to establish, so as to give two routes through Pennsylvania, and a possible alternate connection to Baltimore and the South.

The Dist. Supt. for Eastern Penna. reports that he is without a report from the Traffic Ass't in charge of the northeast section, and on this account is without information as to progress in that section. In this Dist. the following official stations have been appointed:
3HX—Roy S. Fisher, Tacony, Phila., Pa.
3BG—Paul C. Peterson, Folcroft, Pa.
and both of these stations have done excellent relay work, and are valuable additions to the relay system. Official station 3WX (Lancaster, Pa.) reports communication with 3ABP (York, Pa.) and also with 3ACS (Whitford, Pa.). 3ABP is QSO Harrisburg, thus establishing reliable communication between Phila. and Harrisburg, via Philadelphia and suburban stations to 3ACS, 3WX, and 3ABP to Harrisburg. The Dist. Supt., Mr. Place, is in search of a City Manager for Philadelphia, as that city is an important one inasmuch as it is on Trunk Line "D" to the South and is the Eastern terminus of Trunk Line "B".

Little activity is reported from Delaware with the exception of 3OB at Wilmington which is the only station there doing DX work at present. It has been reported that signals from 3OB have been heard in Baltimore, but no active or consistent work has been carried on, and this is another point that must be worked into shape for a reliable route into Philadelphia and from there to the south.

Since the last report Mr. E. B. Duvall, formerly Dist. Supt. Eastern Maryland, (3909 Cottage Ave., Baltimore, Md.) has been appointed Assistant Division Manager in charge of the Southern Section of this Division, comprising Pennsylvania, Delaware and Maryland and the District of Columbia, taking the place formerly held by the present Division Manager. For the present Mr. Duvall is still acting as

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Dist. Supt. Eastern Maryland, but is considering the appointment of a successor. He also has in mind the appointment of a City Manager for Baltimore City.

Baltimore has now a fairly perfect DX working schedule, with traffic control stations on each night. The schedule is arranged as follows, and Phila., Washington, Richmond and Norfolk stations are requested to please note and co-operate.

Traffic Control Stations
On watch 10:30 p.m. to 2 a.m.

Sunday	3AHK	Wednesday	3AHK
Monday	3AA	Thursday	3UG
Tuesday	3GO	Friday	3HG

Saturday 3HG and 3EM alternate

Local work up to 10:30 p.m. DX work after 10:30 p.m. This schedule subject to slight changes, and notices of such changes will be broadcasted and published. Such an arrangement shows that an earnest effort is being made to eliminate some of the QRM which formerly existed in Baltimore, and allow of the operation of the several classes of stations.

Baltimore's best station for DX work is 3HG, Diechmann, and excellent work has also been done by 3AHK, 3UC and 3GZ. No reports have been made of the number of messages handled and stations on the DX schedule who have done such efficient work should make these reports to the Dist. Supt. on or before the 20th of each month.

The report of Mr. Francis Baer, Dist. Supt. for the Dist. of Columbia, shows that there has been considerable advance made in the last few months in Washington, as was evidenced also by the large attendance of Washington amateurs at the recent Third District Convention in Philadelphia.

There are four stations that have been working DX regularly during the past month, namely, 3KM, 3XF, 3IW and 3ALN, and considerable traffic has been handled. DX communication has been carried on in all directions without difficulty, including Baltimore stations, and it has been a pleasure to note that hardly a single night has passed recently that some one in the District has not worked DX. During the period Jan. 20 to Feb. 20, 3KM did the most consistent DX work. 3XF has been in daily communication with 8RQ since the early part of the last month with few exceptions, and has handled messages with a number of stations beyond a radius of 175 miles. While no definite DX schedules have been established with Washington, traffic has suffered very little delay by reason of its stations failing to be "on the job".

Total messages, 628.

ALASKAN DIVISION.
Roy Anderson, Mgr..

At present there are only three licensed amateur radio stations in Alaska: 7EP, Unga; 7IP, Klawock; and 7IT, Ketchikan. 7EP's location makes it impossible for him to communicate with either of the other two until more stations are constructed to form a route or trunk line. 7IP has a dandy quarter k.w. with which he should be able to communicate with 7IT, who contemplates puting in a half k.w. spark or C.W. Should communication be established between these two stations, it is believed that it would not be a difficult matter to establish a route extending thru southeastern Alaska, at least. The thought uppermost in the amateurs' minds, however, is communication with the "states." Were there stations in British Columbia, it would not be a difficult matter to get a message thru, but as far as the writer knows, there is no such station. It is therefore necessary for some southeastern Alaska station to construct a set capable of doing at least seven hundred miles, in order to reach Seattle. This can probably be done, although it may only be possible in favorable seasons.

It is the writer's belief that there are amateurs in Alaska who operate receiving stations only, there being no one in their vicinity with whom they could communicate. An attempt is being made to get in touch with these amateurs, in order that some half k.w.'s, at least, will be making Alaskan amateur radio traffic a realization, and not an ambition, as it is NOW.

This report is, necessarily, short and shows general inactivity on the part of Alaskan amateurs, but it is hoped that only a few more of this type will have to be made.

NEW ENGLAND DIVISION.
G. R. Entwistle, Mgr.

Johnson (1DY) of Lynn reports everything going well in his section except for the persistence which some of the strictly local men keep calling the DX stations. There is a queer sort of QRM in Lynn which sounds like a static machine which goes all evening until twelve midnight. 1DY handled 220 messages with a total of 2410 words, relaying mostly thru 1PAW, 1RV, 1DAC and 1FF.

1HAA handled 147 messages.

1CK handled 160 messages and 1CY, Oliver, of Braintree, who was handling most of CK's traffic during the week, relayed about 200 messages.

Mr. Furlong (1FF) reports conditions around Boston as favorable for the month of February.

1BV, using a small tube transmitter and not much over half an ampere in the an-

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tennae, has been able several times to break thru and handle traffic with the Second District.

Boston amateurs came in for a great deal of publicity during February, 1FF enjoying the sensation of seeing his set and himself on the front page of a local paper, the Boston Traveler. This newspaper is now running a column devoted to radio, keeping local men posted on all matters of interest.

1FV of Portland is handling most of the traffic for his section with Boston.

Mr. Pollard of Burlington, Vermont, reports 1RAY, the station of the University of Vermont, as handling a great deal of traffic for the northern section, clearing thru 8QJ, 9FN, and 1FV.

1TS has been able to clear some traffic from the Canadian stations, 3BP, 2CI, and 2AK during the past month. 3BP in particular is very strong there.

Total messages, 1223. Busiest station, 1DY, 220 msgs.

ROANOKE DIVISION.
W. T. Gravely, Mgr.

Relaying in the Division slackened up to some extent during the past month, but interest is very keen, and we may expect a revival in traffic for the next few weeks to come.

There are several points in the division which have failed to develop as the manager had hoped, and as a result, our daylight line is still in the making—not yet an existing fact. However, with a little extra effort here and there we may be sure that the daylight routes will be worked out during the coming months. The summer affords the ideal time for experiments along this line, for as a rule QRN holds sway during the hot sultry nights, and operation is almost impossible, whereas, in the day the ether is comparatively quiet and in addition QRM is usually nil.

The best work of the division during the past month has been done by those stations on the Virginia Seaboard, with the Northern West Virginia Stations a close second.

Reports from Mr. F. L. Bunker, District Supt. North Carolina, are very encouraging. He says there is a new station at Sanford, N. C., which is being operated by Mr. R. O. Holland; another at Asheville, which is being operated by Mr. E. A. Jackson, and others under way.

Mr. White, City Manager, Norfolk District, states that Mr. Kubiac, 3VV, in spite of a burnt out transformer and rotary gap, has been carrying on with a home-made quenched gap and a borrowed transformer and has been handling traffic with this temporary equipment.

Messrs. Hopkins and Buskey of 3GO have handled quite a lot of traffic this month. They are working on a synchronous gap. There are now three operators at 3GO, Mr. Hopkins, signing "LH", Mr. Buskey, signing "CP", and Mr. Rosenthal, signing "BZ", with his perfect fist.

Mr. Gilpin of 3AB has been spending his time in perfecting a synchronous gap, and hasn't handled much traffic during the past month. Mr. Herndon, 3FG, has had his hands full with his duties as Chief Inspector for the Independent Wireless Tel. Co. at Norfolk, and has had very little time to devote to his set. Mr. White, 3EN, has been going regularly, and has handled a number of messages, but less than the preceding month.

Mr. Wohlford, 3CA, District Supt. South-West Va. District reports progress in his section, with some traffic being handled.

No report from Mr. Blair of the Central Virginia District.

3BZ has been at the key very little since the 1st of January, due to the pressure of business affairs and physical disability, but at that, a number of messages have been handled.

Mr. Heck, 8EF, Mannington, W. Va. states that 8SP is still the star in his locality, handling most of the traffic going through Northern West Virginia. Mr. Heck reports many new stations under way, and is very optimistic over his daylight line down into Virginia.

Link up fellows, for the summer operation.

Total messages, 150.

ONTARIO DIVISION.
A. H. K. Russell, Mgr.

The past month has probably been the best for relay work that the Ontario Division has ever had. It has been marked by the large number of new C.W. stations coming into operation, as well as the successful attempt to increase efficiency on the part of the spark stations.

In the Toronto district, a very interesting development has taken place. Newcomers in the wireless field, in graduating from the spark coil stage to more powerful apparatus, have installed C.W. sets in place of the usual spark equipment, with very satisfactory results both to themselves and to those who must perforce listen to them. The great difficulty from a relay point of veiw now seems to be that border stations do not as a rule listen for C.W. stations and hence it is almost impossible to get in touch, for traffic.

Southeast Ontario seems to be booming along with possibilities for good work from Kingston, Belleville, and Peterboro. Quite a volume of traffic is being handled between Kingston, Napanee and Belleville. A one-way service has been established at set times each week between Toronto and

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Napanee, for the forwarding of relay traffic. A similar service will likely be established with Brantford, and possibly Windsor.

EAST GULF DIVISION.
E. H. Merritt, Mgr.

The progress being made with traffic toward Florida is the outstanding feature this month. 4FD has been taking traffic going south and giving it to 4AM who is working 4DL, 4CS and 4BI. There will soon be a station in Key West, 4BO, and with the addition of a few more good stations we will have a fairly dependable route. A good station between 4FD and 4AM is badly needed and one in Jacksonville would surely help out in that respect.

Old 4AT, now 4ZN, has at last shown signs of life and is working hard to get the Florida stations together. Mr. Gulledge is D.S. of Florida and has appointed Mr. Winford Brown, 4BI City Mgr. of Miami, and Mr. R. M. Robbins, 4AW, City Mgr. of West Palm Beach. Mr. Gulledge would like to hear from good stations in Tampa and Jacksonville.

South Carolina still answers roll call with one station, 4EG. He has been unable to do transmitting recently on account of power troubles. He reports that there will soon be another station in Woodruff.

Mr. McIlvaine, D.S. of Alabama, reports a little more progress made in his district. Two good stations have been opened in Birmingham. It seems an impossibility to get Alabama stations to answer letters. Have all the licensed amateurs lost interest and quit the game? There are stations being erected in Montgomery and Marion but no definite word has been received from the yet. 5XA is doing good work and is still the main station in the state. They have never been able to clear traffic to or from Georgia stations.

For Georgia, only reports from 4XC, 4FD, 4AG and 4YA have been received. 4XC has been doing the best work in the state lately. 4FD is a new man but is rapidly becoming known and is in a position to clear occasionally to Florida. He is the ONLY man we have found that can work the Florida stations at all. 4YA has been on the line for a few nights this month and has made a very good showing. 4AG is still doing good DX work but is still unable to connect with Atlanta and other close stations.

Total messages 157.

DELTA DIVISION.
J. M. Clayton, Mgr.

The weather during the past month has been rather adverse for good work; however, traffic has been going thru the division in its usual style. 5YH, 5ZP, 5EA, 5JD, 5JE, 5YE, 5ZK, 5ZS and 5DA continue to be practically the only stations in the division doing DX work. Thru the forced absence of 5ZL, 5YH has had more than his share of the burden of traffic, having handled something approaching 300 messages for the month.

5EA and 5JE continue to reach out in good style, and 5JE is batting them out like an old timer. Over 5JE's oscillation transformer hangs a slogan "We Never Sleep" and deBen 5ZP says that he never sleeps for the messages coming from 5JE "To: Grace—, signed Francis". At least we know they aren't the "greetings-via-wireless" kind, for there are too many of them. 5ZS has been rather silent during the past month, but every now and then comes on and works a few. Come on, Anthony, get back to that set like you used to.

Tulane University, at New Orleans, has a station under construction and will be ready for work in a short time. This station will be used mainly for research work, but will take part in intercollegiate communication and relay work.

5ZP continues to bust 'em out, and lately has been working up a C.W. set.

5DA has not been heard from in some time, either via radio or mail. It is presumed that business pressure has kept 5DA away from the set.

5YE, University of Mississippi, has started a steady schedule with several operators on which, and is handling considerable traffic.

A new station at Arkadelphia, Arkansas, 5MA, has just been opened up, and already has worked several DX stations.

It is VERY important that ALL stations in the Division send in their reports of traffic to Traffic Chief Greenlaw by the 23rd of the month, at the latest. As stated before these reports should include a list of stations heard from the 15th to the 15th; a station report showing the three most consistent stations heard in each district and the three loudest stations heard from each district, and a report of the total number of messages sent and total number of messages received. It is very important that these reports be sent to the Traffic Chief, as the Division Manager gets none of this information and if the Division is to be counted in in the total number of messages handled thruout the country, the Traffic Chief's report is the only means we have of being represented. It is also important that each station sends in his report to the next official in the Division so that the Monthly report for QST may really be informative of the work being done in the division.

Busiest station, 5YH = 300 msgs.

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NORTHWESTERN DIVISION.
J. D. Hertz, Mgr

The D.M. has just completed a short trip thru the Puget Sound district, visiting several of the DX stations in that part of the country. An enjoyable day was spent in Seattle, and another in Tacoma. The later included an auto trip to station CL1 at Camp Lewis, and to 7YS at Lacey, thru the courtesy of Miss Dow, D.S. at Tacoma. Among the other stations visited were 7AD, 7BK, 7BC, 7CB, and 7CF.

Canadians 5CP and 5AK are reported QSA in Seattle, and the D.M. had the pleasure of listening to 5CP's 360 cycle synchronous spark at 7BK. This spark is not uncommon at Canadian stations, and aboard Canadian ships. It seems to be a spark that would go well in short wave work. Mason, D.S. at Seattle says, "Now that we know there are Canadian amateurs on the job, all that remains is to connect up with them." And he assures us that every means available will be taken to accomplish this end.

A radio association has been organized in Seattle. This is a re-organization of the pre-war Puget Sound Wireless Association. Technical matters rather than matters pertaining to operation will be discussed at the mettings, for the most part.

Two routes are now open thru Montana, one of these being via 7YA to 9YW, and the other being via 7CC to 7ZG or 7EX to 9WU or 9EE. Both of these routes are handling an ever increasing amount of traffic.

7CC reports that 7MA of Spokane, using a DeForest phone, is heard at Moscow, and should prove to be a very valuable relay station in opening up this district which to the present time has been "dead to the world".

7IN has been doing about the best work of any of the stations up the Willammette Valley. He is luckily situated in that he is able to work Seattle and Tacoma stations, which is very difficult from Portland. 7GQ of Eugene is reported good in Seattle, and 7CN is QSA there, but neither of these stations are heard with regularity in Portland. Both of these stations get south fine.

Portland is represented by some ten or a dozen stations, the more notable ones of the past month being 7ED, 7DS and 7JW on short waves, and 7ZI and 7ZB on long waves. 7DA, 7BP and 7ZB have gone out of commission temporarily.

Vancouver is well represented on short waves by 7BJ and 7ZJ, while 7ZK and 7ZJ hold down the long wave end of the ether. 7ZK, 7ZI and 7ZB have worked 9YW. 7ZI and 7ZB held a test over a period of a week with a ship bound from the coast to the Hawaiian islands. The operator writes back from Honolulu saying that he believes that were it not for the NPM arc "mush", he would have been able to have heard both stations all of the way to the dock in HU harbor. As it was, they were heard a distance of a little over 1900 miles.

Total messages 331. Busiest station 7CC = 256 msgs.

DAKOTA DIVISION.
Boyd Phelps, Mgr.

Since the Transcons relaying has increased to a larger amount than ever before. Traffic over the Northern Route has been moving in large proportions which makes it necessary for the few stations covering the jumps to be on the job all night nearly every night. 9WU at Ellendale, N. D., handled 172 msgs in the last fourteen days and traffic is still increasing. Mr. Leavenworth, 9WU, deserves a grat deal of credit for sticking to his job every night until the hook is cleared and often works into daylight. He clears west with 7ZG mostly but at times with 7CC, 7EX, KDIB, 6WV, 6ZH, and 9YW. Part of his eastbound traffic is cleared south and part to 9XI, 9HM and 9ZT, depending on conditions. Another good station in North Dakota is 9EE who unfortunately is also in Ellendale but who runs 9WU a close second.

We are safe in announcing at this time that any quantity of traffic can be handled to Winnipeg, Manitoba, if routed so as to reach either 9WU or 9ZC. A new station OFN at Pembina, N. D. has been handling traffic between 4BG and 9AGN so constant communication is assured. We welcome your Canadian traffic.

We note with great rejoicing the springing up of stations in the smaller towns scattered about the Division. District Superintendents are working to get these stations lined up for branch routes and plans are being made for the routing of summer traffic. A great effort will be made to keep traffic moving in shorter jumps all summer. Stations who have not yet heard from their District Superintendents should write him and find out his plans for relay routes as there are still large areas where no stations can be located. Any station owner in doubt as to which district he is in or who to write to should write directly to the Division Manager whose address for mail is 3344 First Ave., So., Minneapolis, Minn.

Total msgs 706.

WEST GULF DIVISION.
Frank M. Corlett, Mgr.
Raymond L. White, Asst. Mgr.

Our report, while rather interesting from a traffic standpoint, is by no means complete. A complete report cannot be made

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up unless we have the material from which to make it, and this material can only be furnished by the station owners in the field. If you station owners do not report the amount of traffic handled to your City Manager, Asst. Dist. Supt., etc., and they in turn make their reports to Division Headquarters, we of course can not make up a report that is true to the conditions throughout the division.

Co-operating with the Dallas Police Department, 5ZC and 5ZG, are sending Police Broadcasts, information furnished by the Police on crimes, stolen automobiles, etc. These broadcasts are being copied and delivered to other police departments by some 20 to 30 out of town stations. We want more out of town stations to copy these broadcasts and be sure and let us know that you are copying them so that due credit may be given your station. Broadcasts are sent as received from the Police but are repeated on a regular schedule by 5ZC at 7 and 10 P.M. 375 meters.

District Supt. Dill of Oklahoma sends us his first monthly report and for a starter it is indeed good; weather conditions in Oklahoma for the past three weeks have not been good, but traffic is going through splendidly just the same. From Oklahoma City, traffic passes east through 5JD and 5YH, and north it seems to go well through most any station. Oklahoma stations are handicapped in handling state traffic due to signals swinging very badly, but tests are being made continuously. 5JS and 5HK have been doing some fine DX work.

Asst. Dist. Supt. Selby, of Muskogee, reports conditions in his territory are encouraging, 5BR will soon be on the job again with a greatly improved station. 5LO of Miami, is doing good work, being reported QSA by 9ZC at Baudette, Minn.

A.D.S. Schonwald of Blackwell sends in his resignation, account other duties permitting no extra time for League work.

All station owners who have not done so, kindly get in communication with Mr. Dill, Mr. Selby or Mr. Poor and get lined up with the A.R.R.L. and let's get things moving fast and in a more satisfactory manner.

Dist. Supt. Falconi, of Roswell, reports that traffic is going through on all routes without any difficulty, and total number messages handled by 5ZA this month 215. Also correct last month's report to read 494 messages handled by 5ZA instead 247 as previously reported, as relayed messages only counted as one instead of two.

Dist. Supt. Tilley of the Southern Texas District reports encouraging for the Austin Texas Territory. Several new stations have made their appearance on Trunk Line F, completing the route to San Antonio with a branch. The Austin City stations are busy doing much daylight work and keeping the air busy almost continuously, stations 5JA, 5EJ, 5BO and 5ZU doing the greater amount of relay work. Traffic with Houston direct is still impossible due to bad QSS, and our only come-back is dear old 5XB for a relay both ways. Houston Territory handled a total of 537 messages.

5ZR, 5KQ, 5IO and 5GS, all of San Antonio, afforded a reliable outlet to San Tone, through New Braunfels, and it is believed this line can work all right the year around. San Antonio stations will QRX the first five minutes of the hour and half hour to co-operate with W UJ and will be open for traffic work after 9 p.m.

A.D.S. Martin of Amarillo sends in a list of quite a number of amateurs that he is trying to get in shape to do effective work as soon as possible, and states that stations consistent from his station are: 5BI, 9AEZ, 6IG, 9LR and 9EL.

Dist. Supt. Heafer is back from his honeymoon.

A.D.S. Henry Harris of The Waco Texas Territory reports stations have been located at Temple and Hamilton, and look very encouraging, especially the former, as he will be of great help to us on Trunk Line "F". Three new stations have opened in Waco, namely: 5GG, 5CC and 5FB.

Guy Neel, 5LR, Dublin, Tex., reports traffic going through in great style.

Reports from Asst. Dist. Supts. Pierce and Dorsa are missing.

Total messages 1216. Busiest station 5JA, 150 msgs.

CENTRAL DIVISION.
R. H. G. Mathews, Mgr.

It is seldom that the District of Northern Indiana leads this report, not because of ability there but largely because of an unfortunate paucity of stations. This month, however, we are giving this District first mention because of the splendid spirit shown by its D.S. Mr. H. H. Moore of Elkhart, Ind. Mr. Moore has been extremely ill for the past month and in fact has been so sick that he has been unable to write letters personally. Nevertheless he has kept his organization going, carrying on his correspondence through others and has submitted an excellent report covering the activities of his District during February. Mr. Hutchinson, A.D.S. Northern Indiania, has been co-operating with Mr. Moore very closely and reports for March should be sent to him. Several of the stations in Northern Indiana which have been out of commission for the past month are again operating, among which is 9ME. Other stations which have been

(Concluded on page 47)

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Determination of Resistance, Inductance and Capacity by the Wheatstone Bridge Method

By Julius G. Aceves

Research Assistant to Dr. M. I. Pupin, Columbia University

Presented before the Radio Club of America, October 22, 1920.

IN order to understand the behaviour of circuits, such as used in wireless telegraphy, the first step is to ascertain the constants of the various pieces of apparatus of which the circuit is made up, and their combinations, so that the laws of action and reaction may be properly applied.

In alternating current circuits there are two reactions against the applied E.M.F.; the dissipative, and the conservative reaction. In the first case, energy is transferred in or out of the circuit, and in the second case, energy is merely stored in the electro-static or electro-magnetic fields. The first kind is the result of a RESISTANCE and the second one of a REACTANCE. It is our aim to show how these can be measured in a very accurate and convenient manner.

At the bginning of the Twentieth Century, Dr. M. I. Pupin of Columbia University suggested and used the Wheatstone Bridge with alternating current to determine resistance and reactance and we use it now at this research laboratory as the standard method for measurements with currents of from 20 to 200,000 cycles.

This method of measurement requires three principal devices:

I. A Wheatstone Bridge.

II. A Source of Alternating Current.

III. A Detector that indicates when the bridge is balanced.

I. The Bridge.

The theory of the bridge tells us that in order to have the difference of potential across the detector D (Fig. 1) at all times equal to zero, the resistances and reactances must satisfy the condition

$$\frac{R_a}{R_b}=\frac{R_s}{R_x}, \text{ and } \frac{R_a}{R_b}=\frac{X_s}{X_x}$$

where $X=2\pi f$ or $\frac{1}{2\pi fC}$, produced either by inductance or capacitance. The subscripts denote the bridge arm to which they belong, s meaning standard and x the unknown.

There are various methods of balancing a bridge, but we shall only show the most important ones.

I. Balancing an unknown impedance against an adjustable standard resistance and reactance.

II. Balancing against a fixed standard reactance and adjustable resistance, varying the ratio arms of the bridge.

III. Balancing a reactance by a standard one of opposite sign by a resonance bridge.

IV. Substituting in the bridge already balanced the unknown by adjustable standards.

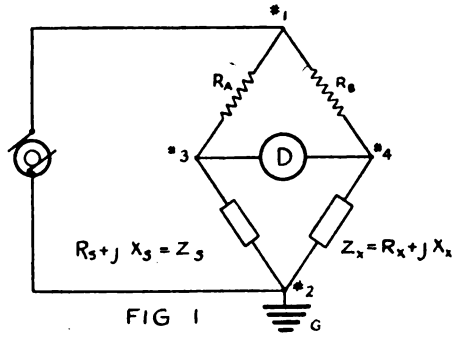


FIG 1

Examples of carrying out each respective method shown above follow:

I. This is a very simple method and accurate when the power factor of the unknown Z is about 70%, that is, X= R.

Example: To measure a 2 milihenry coil at 25,000 cycles, having about 300 ohms resistance. A variometer is connected with a resistance in arm S as per Fig. 2.

II. When an adjustable standard coil or condenser is not available, then use a fixed one and adjust the ratio $\frac{R_a}{R_b}$ and the resistance R_s.

Example: To measure the effective capacity and resistance of a cable, having a 0.1 mfd. condenser, connect as per Fig. 3 and vary alternatively the ratio $\frac{R_a}{R_b}$ and the value of R_s.

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III. If a coil or condenser has a very low power factor, say of 2%, then very serious errors are usually made when using methods I and II without a great many precautions. Then a non-reactive bridge will give excellent results.

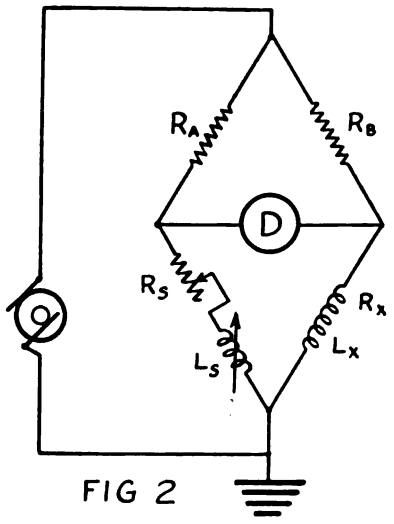


FIG 2

Example: To determine the inductance and resistance of a "duo-lateral" coil. Connect as per Fig. 4, using a standard mica or air condenser. Then

$$L_x = \frac{1}{(2\pi f)^2 C}, \text{ and } R_x = R_a \frac{R_b}{R_a}$$

If f is not known, a standard L_o is substituted for the unknown and the bridge rebalanced with a capacity of C'_s, when

$$L_x = L_o \frac{C'_s}{C_s}$$

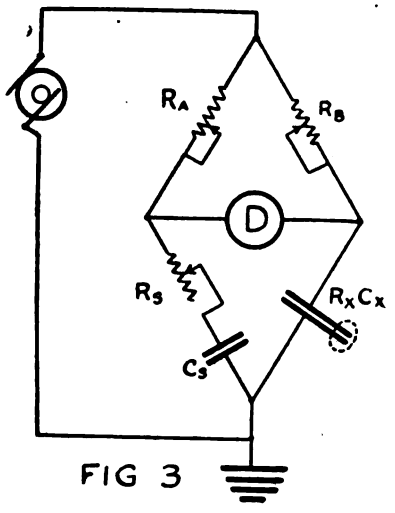


FIG 3

IV. For very small capacities a substitution or differential method is very accurate. (Fig. 5.)

Example: To determine the capacity between grid and filament of a vacuum tube.

Connect as per Fig. 5, balancing the bridge against a ballast condenser C_o which may be known or not. Then close switch (K) and without disturbing anything else, rebalance by means of C_o. The difference is the unknown C.

The principal sources of error are:

A. Electrostatic and magnetic induction upon the detector from any part of the circuits.

B. Stray capacities and conductances across the various standards, and the unknown.

C. Mutual induction and capacity between these pieces of apparatus.

D. Self-induction of long leads and of some resistances of very small value, say one ohm or less, when using low impedances.

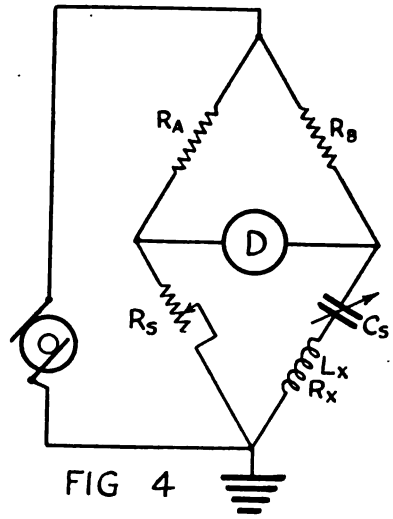


FIG 4

The first and second sources of error are usually the most serious ones. In order to eliminate the first cause, i.e. induction upon the detector, it must be thoroughly screened; but the details will be given when we will show the design of this apparatus.

The stray capacities are unavoidable; they may be made very small and also their effects can be compensated by the following method.

After the best arm ratio $\frac{R_a}{R_b}$ has been selected, the unknown and the standard should be disconnected from corners 3 and 4 (Fig. 1) and a small variable air condenser placed between ground 2, and either

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corner 3 or 4 as the case may require, and adjusted until the detector is silent. Then the arm ratio should not be disturbed materially, otherwise a new setting of the condenser will be necessary. The other sources of error may be avoided by skillful selection of the apparatus and of their relative positions, as well as by electrostatic screens suitably located.

II. The Source

The source of A.C. usually is an oscillating audion. It must be such that

(a) the frequency is constant.
(b) the wave shape is sinusoidal.
(c) the voltage is constant.

The oscillating circuit should have a wide range in frequencies and be as free as possible from complicated adjustments. Fig. 6 illustrates a circuit in which these conditions are practically fulfilled.

Two audions are used, and the feed back is obtained by means of a small condenser k, (Fig. 6), made of about 3" of twisted

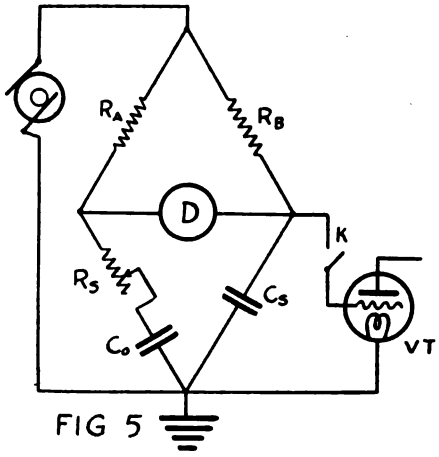


FIG 5

insulated wire. This is fixed for any frequency from about 200 to 200,000 cycles. To vary the frequency all that is necessary is to vary the product LC of the oscillating circuit by adjusting C for various values of L.

A hot wire or a thermo-galvanometer G will measure the A.C. only, as it is in series with a condenser, and may be calibrated in volts. Across its terminals the bridge may be fed directly or thru a potentiometer to reduce the voltage.

In order to secure constant frequency without having to regulate closely the filament current and plate voltage, certain relative values of L and C for a given frequency should be used. By experience we found that it for a given product LC we select C=2L, L being in henries and C in microfarads, the frequency will remain constant within 1% for a 100% change in plate voltage or about 25% in filament current. The assumption involved is that the coil should have a reactance at least 20 times its resistance.

III. The Detector

The detector consists of a receiving set specially designed so that it is:

(a) Responsive to nothing else but a difference of potential between corners 3 and 4 of the bridge.
(b) Selective.
(c) Sensitive.

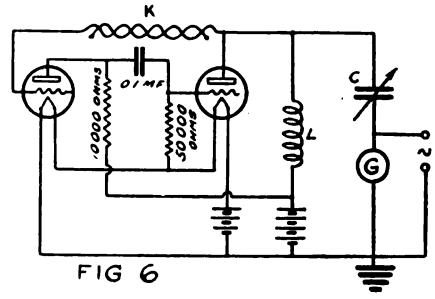


FIG 6

The first condition is of the utmost importance, otherwise misleading balances would result, introducing errors at times of many hundred per cent.

If the detector is selective, it is not necessary to use a pure sine wave for the test, as the detector would be unaffected by the harmonics.

Fig. 7 shows a detector for radio frequencies employing no amplifiers.

Here is a small inductance coil L_1 with a corresponding condenser C_1 (Fig. 7), joined to Corners 3 and 4 of the bridge, (Fig. 1), and becomes the primary of a regular autodyne receiving set. The only difference from an ordinary set is that it must be all enclosed in a metallic box of rather thick walls so that no electrostatic field may disturb it. A peculiar screen, S, is used between the primary coil L_1 and

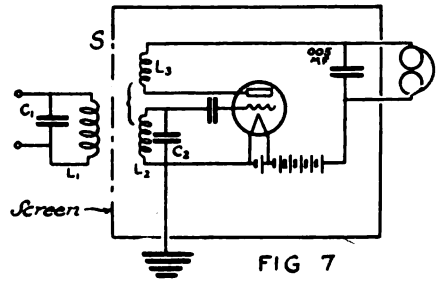


FIG 7

the secondary coil L_2 connected to the grid, to prevent electrostatic action and to permit the magnetic field to act upon the detector. This screen may be constructed by pasting tinfoil on a thin board and cutting slits to prevent eddy currents. The tinfoil and the metallic box should be

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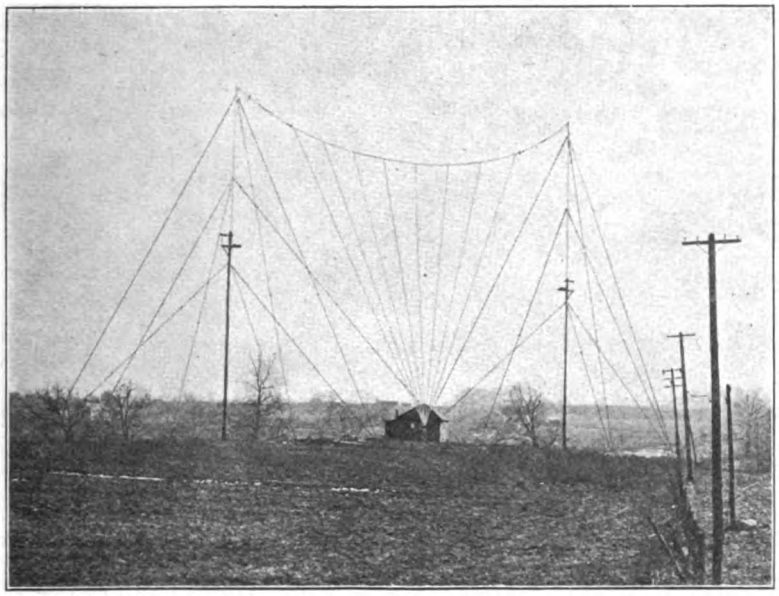
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Amateur Radio Stations



8ZR, MANSFIELD, OHIO



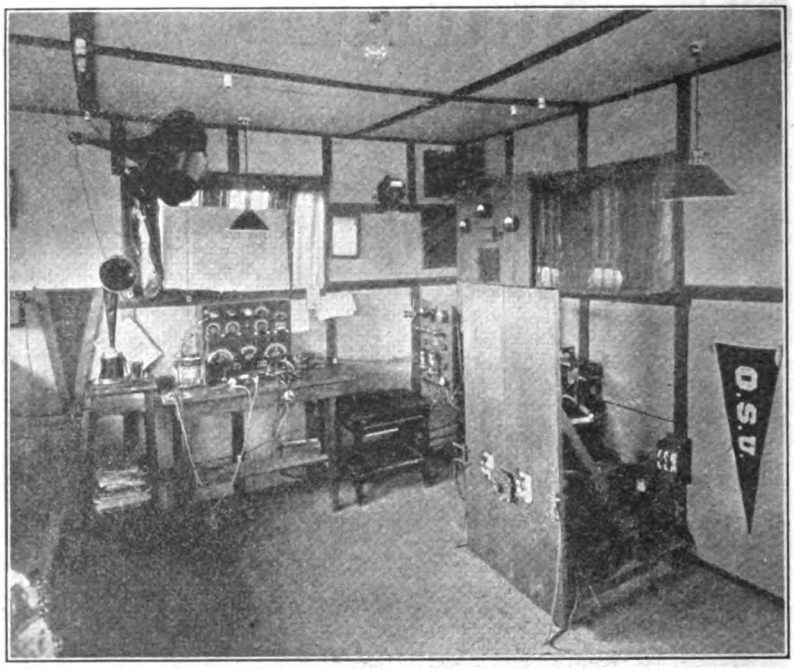
The Radio Club of Mansfield was organized in June, 1919, C. S. Fernyak being elected secretary-treasurer and C. C. Endly president. The members decided to pool their apparatus and contribute $250 each towards the erection of a real station. 8ZR of today, formerly 8HH, is the final result and is a good example of what a club station can be.

8ZR is located in a large open field on the outskirts of Mansfield, which is the highest city in the state of Ohio. The aerial is a vertical fan of eight wires, 110 ft. high, with the station building midway between the two masts. An excellent job seems to have been done of all the outside work. The eight aerial wires are gathered at a large insulator fastened to the top of a stout post in front of the station, with the lightning switch inside a weatherproof box on the side of the post, and with the lead-in running from the box thru the station wall. The ground system is of "Round's round ground" type, consisting of copper plates buried endwise in a circular trench six feet deep and one hundred thirty feet in circumference. (Get that, you chaps:——.. 130 ft. circumference!) The station is located in the center of this system, and leads of 2-inch copper ribbon supported on *insulators* on short posts run radially to the buried plates. This is our conception of an ideal ground system.

8ZR has experimented the past season with several spark transmitters. The first consisted of the transformer and gap from a Clapp-Eastham Hytone set, with Dubilier .01 mfd. condenser and Thor O.T., which put in the antenna 10 H.W.A. amperes on 200 m. and 14 amps. on 375 m. on about 2 k.w. input. Later with an Amrad quenched gap and the same other equipment 15 to 17 amps. were obtained on 375 m. Since the first of the year the equipment has comprised an American Radio

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Sales & Service Co.'s gap and oscillation transformer, Thordarson old-style 1 k.w. transformer, and Dubilier .01 condenser. The input as shown by a Roller-Smith watt-meter is exactly 1 k.w. and the antenna current 11 to 12 hot- wire amperes on 375 meters. All of 8ZR's extreme long-



distance work has been done on this last set.

The deForest Type O Radiophone has a voice range of a hundred miles with 0.8 amps. in the antenna, and its CW has been reported from Lawrence, Kan., and Ellendale, N. D.

The receiving equipment shown in the photograph is a Chicago Radio Laboratory's Z-Nith Regenerator and Amplifigon but has since been replaced by similar apparatus manufactured by the American Radio Sales & Service Co.

With the last-described transmitter 8ZR has been putting traffic thru consistently in jumps of up to a thousand miles and has been heard a number of times on the Pacific Coast. On Jan. 19th 6EJ at Walnut Grove, Cal., heard 8ZR twice, six inches from phones and on Feb. 24th 6AK, also of Walnut Grove, heard him all evening long a foot from phones on one step, while on Feb. 14th 7ZJ at Vancouver, Wash., reported him QSA. Which is reaching out, art.

6IG, DOUGLAS, ARIZ.

6IG is one of those few good stations in the sparsely-radioed Southwest where relay fame is naturally thrust upon a good station because the traffic has to go thru and there are only a few to do the work.

The aerial is a 4-wire T type with a flat-top 70 ft. long, suspended between 70 ft. poles while the ground consists of 1000 ft. of half-inch copper strip buried under the aerial and a connection to buried hot-water boilers.

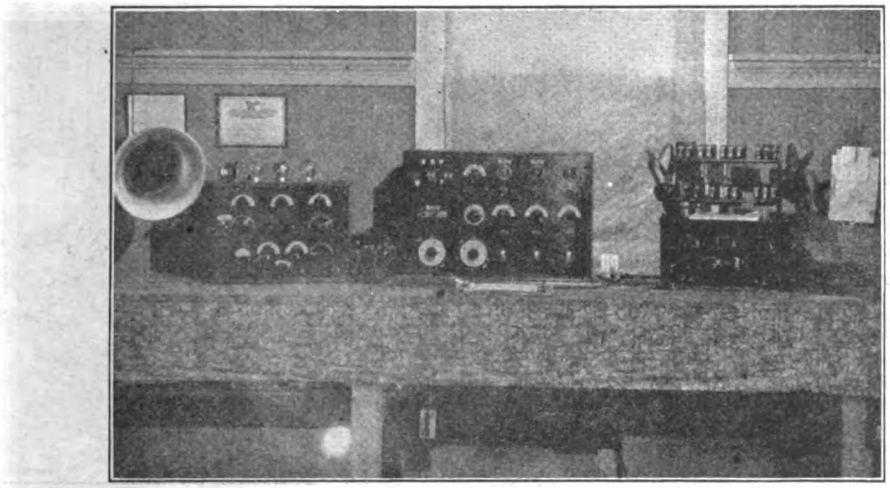
The transmitter is in duplicate and is located in the cabinet under the table, easily accessible, but unfortunately not showing in the photograph in any detail. There are two transformers, an Acme and a Thor, both 1 k.w., operated by the same key, with a three-point lever switch on each to select either set or to vary power. No other switching is necessary. The two condensers are of .008 mfd. each, home-made of No. 213 Bakelite in oil, three sheets of 1/32" insulate being used between a pair of .005" copper plates, with ⅛" separators between plates to allow oil circulation. The oscillation transformer has a secondary common to both circuits but with individual primaries, each consisting of a single turn of heavy ribbon mounted on top of its condenser, with one end connected to the center point between the two condensers and the other end con-

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necting (thru the rotary gap) to the outside terminal of the proper condenser. Only one rotary is used, a Hyrad, a gap across two teeth being used on either side for the respective primary circuits. The gap is enclosed, with glass windows, and runs 3600 r.p.m. At the gap speed used the antenna current with the Acme is 5 amperes, and with the Thor 4.5 amperes, input 1020 watts, current readings made on a Jewell thermo-couple ammeter.

A rotating aerial switch starts the gap motor, "puts juice on the key", turns out all amplifiers, selects long or short wave receiving set or radiophone, and in its off position grounds the aerial, all without complication in wiring or lengthening connections.

The receiving set in the photo is made of deForest equipment, with four steps of well-behaved shielded audio amplification, with separate A and B batteries for detector and amplifiers. A new short-wave set has been made up of Radio Shop parts built into a duplicate of a Grebe CR-6, with plug and jack to use the same tube equipment as the long-wave set.



There are two operators at 6IG; Buxton, sine "BN"; and Gooding, "CL". Solid message copy of 6IG's signals has been made by 8IB, Columbus, Ohio, and ships at sea have been worked. The relay work is mainly with 5ZA, 9LR, 9OE, and 9AEG to the east, and 6DP, FD, 6ZN, 6EA, etc., west. Ten hundred and fifty four messages were handled between October and February, which speaks for the volume of traffic passing thru the Southwest.

3AOV, STONEGA, VA.

Mr. S. J. Gundry, Manager of Stores of the Stonega Coke & Coal Co., located in Stonega, Va., is here shown seated at his radio set. We will let him tell his own story:

"About a year ago I learned that I could get time signals by wireless and immediately got busy, purchased a deForest RS-200 Time Receiver, and after a good many ups and downs heard NAA's time signals in May, 1920. As I have been a 'time fanatic' for 25 years you will be unable to appreciate the joy I expected when the signals were first heard. No one (unless a real bug) can know the convenience of going to your home at several stated intervals each day and getting the correct time, not having to wait on the telegraph system, fearing the wires are down, no connections made at relay points, operators using the wire, etc. It surely is a pleasure to one who desires absolutely correct time.

"In this connection it may be of interest to the amateurs to say a few words concerning time: A watch ticks or beats 5 times a second or 432000 times each day and to keep correct time (by which I mean within two seconds) a watch should be wound regularly; wind it say at nine p.m. or at any other hour. Morning is the better time, if you can. When you have selected your hour for winding, wind it each day or night at this hour or as near it as possible. Keep your watch '12 up' at all times. Do not lay it down at any time, and always fasten it to a chain arranging so that the watch must stand '12 up' in your pocket. At night time leave it in the pocket; do not lay it on its back, under your pillow or on the dresser.

"My watch is *never* in any other position than '12 up', night or day. My best record

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to date is 2 seconds gain in 88 days or 10 beats more than actual correct time of 38,016,000 beats. Let's hear from some other time fanatic. I really believe I have a watch second to none in the world.

"After learning the alphabet in May 1920, and getting so much enjoyment, I secured a Penn C Regenerative set, which is giving excellent satisfaction. In fact KDKA concerts and NSF come in so loud, I am having wireless parties every night; of course you must take care of the ladies.

"Having just received my call, 3AOV, am fearful will have to stand off the parties somewhat and get into the real game. I have two antennas, one 75 feet long, 45 feet high, T shape of 4 wires; the other 450 feet long, single wire, 90 feet high. Also have 1KW Acme, Benwood gap, Thordarson oil immersed condenser and pancake oscillation transformer, wavemeter, ammeter, rectifier, voltmeter, Brandes and Baldwin mica phones.

"Have several danger signs, one of which reads 1,000,000,000 Micro-Henries equals 1 Henry—Danger—Keep Away. Lady inquired who is "Henry"?

"Expect to make a few improvements to increase radiation and then for out in the big lot."

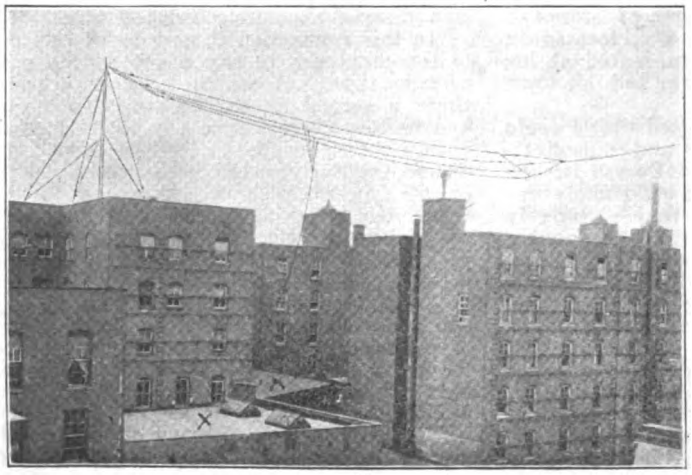


2SZ, TROY, N. Y.

2SZ is the station of the Troy Y.M.C.A. Radio Club, affiliated with the A.R.R.L., and illustrated in the following photographs.

The antenna is a 4-wire T, average height 115 ft., 97 ft. long, stretched between two masts two hundred feet apart. The two tin roofs marked X in the photo are made to serve duty as grounds, together with the water supply, drainage system, and steam piping of the building. The station being on the third floor, a short ground lead to earth was impossible.

The transmitter has a 1 KW Thordarson and a 1 KW Blitzen transformer, either of which may be used, a glass plate in oil condenser, 8-point HyRad gap, 2 inch copper oscillation transformer, and Clapp-Eastham antenna switch. Many DX men are under the impression that 2SZ's "juice" is 25 cycles, but it is 40 cycles. Their peculiar warble, however, seems to cut thru average QRM in very good shape. With six inch coupling the antenna current is 4.5 amperes on a thermo-ammeter, with a decrement of .09 on a Kolster decremeter.



The receiving apparatus is home-made and consists of a short wave regenerator, audiotron detector, and Baldwin phones. No amplifier is used at present.

2SZ is operated every Tuesday, Wednesday, Thursday and Friday

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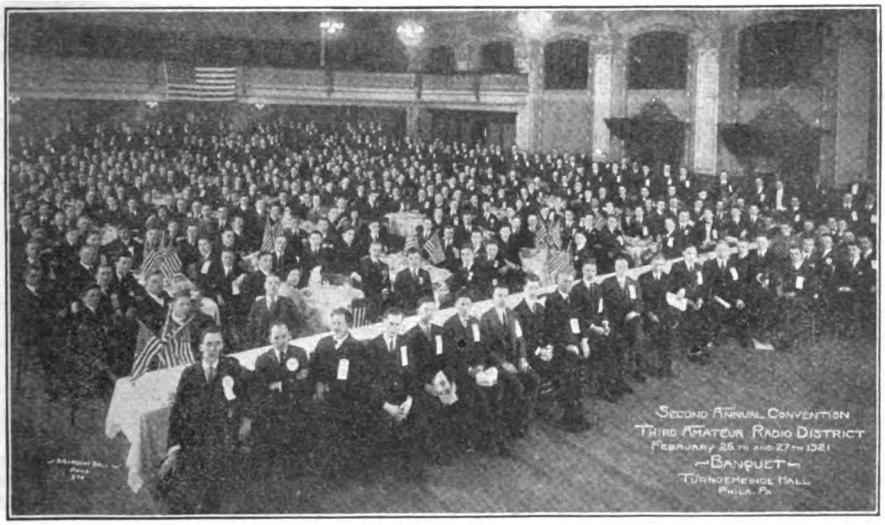


E have the honor of announcing the affiliation of the following additional societies with the A.R.R.L. as of February 19, 1921:

Colorado Springs High School Amateur Wireless Assn., Colorado Springs, Colo.
St. Paul YMCA Radio Club
St. Paul, Minn.
The QSA Radio Club
So. Richmond, Va.
Tri-County Radio Club
Richmond, Va.
Montreal Radio Association
Montreal, Que., Canada
West Allis Radio Club
West Allis, Wisconsin
United Electric & Wireless Assn.
Hagerstown, Md.
Radio Club of Jamaica
Jamaica, New York
Stuyvesant Radio Club
New York City, N. Y.

The Philadelphia Convention.

The second annual convention of the Third District, which was held in Philadelphia on the 26th of February, was a great success in bringing all parts of the District together, big delegations being present from Baltimore, Washington, Norfolk, etc., with inspiring enthusiasm. Over



Fort Wayne Radio Assn.
Fort Wayne, Indiana
Radio Assn. of the University of Vermont
Burlington, Vermont
Union Central Radio Association
Cincinnati, Ohio
The Morris County Radio Club
Morristown, New Jersey
The Hudson Amateur Radio Club
New York City
Northwestern Radio Club
Detroit, Michigan
Wayland Academy Wireless Club
Beaver Dam, Wisconsin

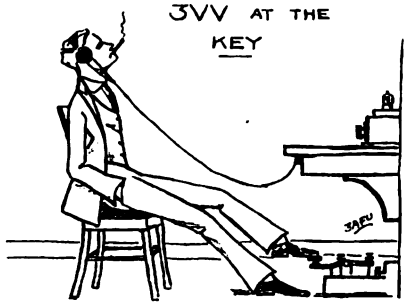
four hundred were present at the banquet in the evening, in the immense Turngemeinde Hall, where with the best of good times many fellows who had been working each other thru the air in an impersonal way made friendships which cannot help but result in knitting the whole district together in a spirit of co-operation as could be accomplished in no other manner.

Convening at 10 a.m., an address of welcome was delivered by Dr. Gordon M. Christine, M.D., President of the Convention, to whose untiring efforts much of the success of the convention is creditable. Mr.

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K. B. Warner, Editor of QST, responded on behalf of the visitors, and the meeting was then turned over to the delivery of technical papers in a series. which continued without interruption until 6 p.m., many of the gang entirely forgetting lunch in the pursuit of knowledge from the splendid array of talks presented under the chairmanship of Mr. S. Kruse. Some of these papers we hope to secure for presentation in QST.

One of the prime purposes of the convention this year was the institution of some scheme to improve Third District operating conditions. A paper by Mr. R. H. G. Mathews on "The Chicago Plan", late in the afternoon, opened the dis-

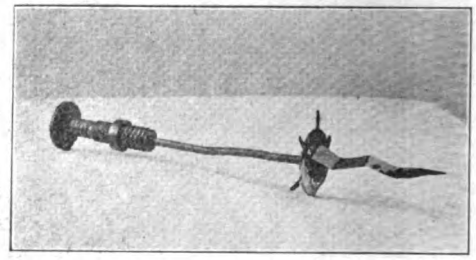


cussion on this question, and the convention went into the matter in open session and with plenty of spirit. After discussion of some of the major aspects of the problem, a representative committee of about twenty-five prominent men from various sections was appointed to formulate a detailed plan and present it to the Convention. This committee had a hard task but the co-operation was good to see and while naturally ideas differed regarding details, nevertheless the large majority were of the opinion that the motto of "live and let live" was a good one in radio as well as in other walks of life, and a plan was adopted by which it is hoped that unnecessary interference may largely be eliminated, and admitting of all classes of stations working in a harmonious manner



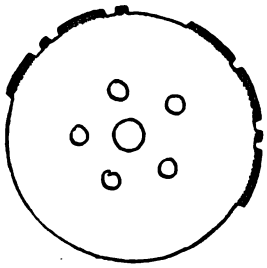
KRUSE AT 9:55 P.M. PREPARING FOR 10:00 P.M. QSS TEST

under proper and sensible rules. The plan calls for the creation of The Third District Amateur Radio Council, with officers and a board of governors, and with all the amateurs of the district as members. A district board of amateur inspectors, each in charge of a geographical section, is to be formed, and each is to organize his section by calling together the various interests therein and causing them to elect representatives to form sectional boards which will be empowered to handle local matters. For instance, each club will have two representatives on the board handling affairs in its section, and those representatives can be instructed to look after that club's interests, etc. This organization will be the machinery by which district-wide co-operative measures can be put into effect, and will make possible individual help for those who need it. The plan is not one of punishment or "fines", but of helpfulness.



At the banquet this scheme was adopted by a vote of those present, and the preliminary organization work is already under way. The banquet was an enjoyable affair interspersed with songs, movies, music, and lantern slides, some of which latter, product of The Washington Radio Club, we reproduce on these pages. During the proceedings The Washington Radio Club presented Traffic Manager Schnell with a genuine Rettysnitch, already minus two teeth in a preliminary test of its QRM-minimizing ability, and as our photograph shows, surely a fitting helpmate for the Sacred Wouff-Hong. While the Wouff-Hong acts by leverage, the application of the Rettysnitch is rotary. The Traffic Manager is keeping it unlimbered for any

The Only Omnigraph Disc at 5XA



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emergency.

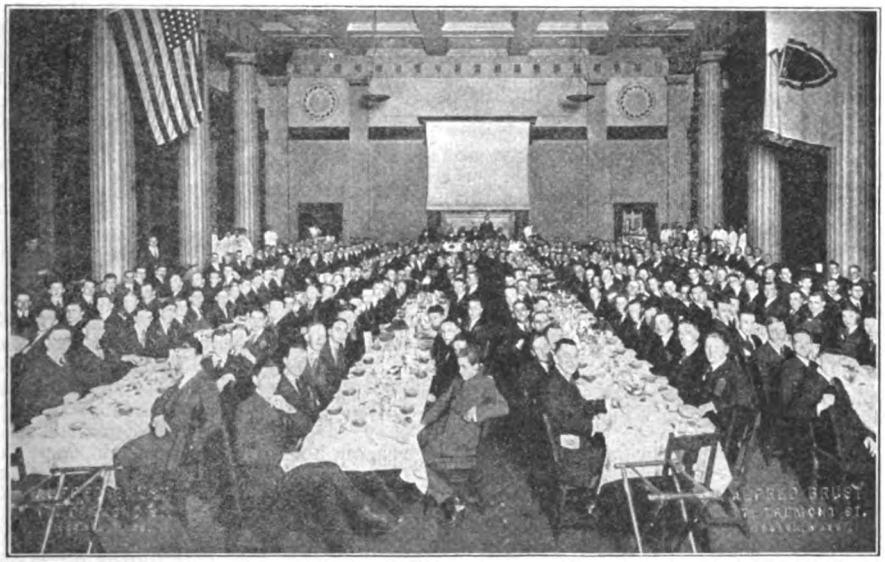
The Convention selected Washington, D. C., as the place for the 1922 Third District Convention, and elected Mr. S. Kruse, of Washington, as President of the organization. From the enthusiasm shown by the Washington and other southern contingents, it is quite evident that the next convention will be a good one also.

Boston Radio Dinner.

A good three hundred New England brass-pounders got together in beautiful Walker Memorial Hall at the Massachusetts Institute of Technology, Cambridge, on the occasion of the annual banquet of the Boston district affiliated clubs of the A.R.R.L. on March 5th, the M.I.T. Radio Society doing the honors. Representatives were there from most of the New England clubs and some of the nearer ones turned out en masse.

After an enjoyable dinner talks were given by Radio Inspector C. C. Kolster, who promised his hearty assistance in any co-operative measures which may be adopted; former inspector H. C. Gawler, who read a paper on power tube operation illustrated with numerous slides; Mr. Hiram Percy Maxim, our president, who incidentally being a Tech graduate of '86 was given a rousing reception by the M.I.T. contingent; Mr. F. S. Dellenbaugh, Jr., instructor in E.E. at Tech; Dr. A. E. Kennelly, known and beloved by all; Dr. V. Bush; and K. B. Warner, our secretary-editor. Mr. Dellenbaugh exhibited thru the courtesy of the Western Electric Co. a Bray movie of the action of electron tube circuits, the electrons whizzing thru the circuits in what we *think* was a most realistic fashion; at any rate it was intensely interesting and carefully absorbed by all. Following the diner an expedition was made to the Tech station, 1XM, where a big variety of equipment was on exhibit and in operation, including a 500-cycle set, a 3-phase quenched gap set, a 5-watt phone, and a 500-watt C.W. set in construction. The Boston Traveler had out a souvenir edition for the banquet, most of its first page being devoted to the affair, and a copy was at each guest's place. (Incidentally, the Traveler publishes three times a week a column entitled "Citizen Wireless", written especially for radio men and edited by G. R. Entwistle, our Division Manager.)

Copies of the photograph of the banquet, 6½ x 10½", can be obtained for $1.00 each from Alfred Brust, 171 Tremont St., Boston.



Houston Radio Club.

The Houston Radio Club of Feb. 12th and 13th held its first annual Banquet and Hamfest with most of the leading south Texas DX men in attendance, Division Manager Corlett thru absolute necessity being absent to the regret of all.

Decorations of a most unique sort were everywhere in evidence, there was a spread of "radio eats" to tempt the most fastidious, and some very interesting contests were held and the winners awarded valuable prizes. The second day of the convention was spent in visiting the various Houston stations.

Mr. F. C. Estey of the Essex County Radio Assn. paid the Houston club a visit recently, and delivered a lecture on club organization which was very helpful. Mr. Estey was voted an honorary member of the club.

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We used to have a spare Editorial Goat but it has been annexed by the practice of some folks in talking about how many amperes they radiate. For goodness' sake, fellows, get right on this thing. It's true that in a given aerial and for a given decrement, spark frequency and wave length, the more the antenna current the more the radiation to be expected, but you don't radiate amperes. You radiate energy —which is measured in watts. So say that your antenna current is so many amperes, not that you "radiate" that many amperes.

Fellow dropped in the other day and said he had heard 6BO very QSA. We always told Bill Woods of BCO (now 9ZB) that he had a rotten fist.

"My brother gave me a slip of paper for Christmas on which he wrote 'A Year's subscription to QST. Well, January came around and no magazine, so I asked him where he sent the subscription and he told me he loaned me the two dollars last November!! What the hexx do you know about that?"—U. G. P.

8ZW gets 550 D.C. for his C.W. set off the trolley wire for four bits a month. Doesn't even need filtering. Pretty soft.

Wanted: Quiet room in the country by patient who wishes to cure himself of severe case of KEY-itis. Address—3AHK.

The "Rock Crusher" at 9ZN is still fiercer at close range. Ask Hassel to show you the ear he put against the antenna lead.

In the press and in various radio publications announcement has been made that the call letters "KDKF" have been adopted as a secondary "SOS", signifying that individual life was in danger and medical advice needed. This statement is incorrect. The call letters belong to the Seaman's Church Institute, New York City, on a limited commercial license which is used only between 2 and 10 p.m. for emergency medical service in the case of vessels in the vicinity of New York. There is no authority for using these letters in the general way suggested in the press.

The Radio Corporation of America recommends A.C. in preference to D.C. for heating the filaments of their power tubes, A.C. giving a better distribution of electron emission and potential gradient. When stepped down from a higher voltage, the adjusting rheostat should be in the primary circuit so that the terminals of the secondary may be connected directly to the filament; then with the return from grid and plate circuits connected to the central point of the secondary winding, the circuits will be symmetrical. The filament current should be adjusted to within 3% of the normal value; less than this makes it impossible to get the desired output, while exceeding normal by 3% will reduce the life of the tube by as much as 50%. This is in the case of new tubes. As tubes approach the end of their life the filaments are becoming smaller in cross-section because of the emission, and it is therefore really desirable that the *voltage* across filaments be kept constant rather than the *current* thru them, for as they decrease in diameter it is hardly reasonable to suppose that they can continue to carry the same current.

3UJ (Baltimore) claims to have logged 6DA. Will the young gentleman in Baltimore using that call please step forward? —"The Radio Condenser."

What we want to know is where "The Radio Condenser" got that illustration for their advertisement of the Philadelphia Convention. Kippy, eh wot, ol' deah?

Noticed the silence of 2TF? Mr. Franklin has left amateur radio and is now an operator at the Belmar station of the Radio Corporation. Recollecting that mean swing, we think possibly the ops on the other side are fortunate in having Franklin receiving instead of transmitting.

Got an aerial fastened to a tree? Run the rope thru a pulley fastened in the tree, with a heavy weight on the end of the rope, and it will take care of itself when the tree sways in a wind storm.

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Lines to Miss M. A. G.

Oh Lady Bug! Dear Lady Bug!
If it could only be
That all the girls were just like you,
So quiet, friendly, frank and true
And yet could laugh the way you do—
They'd make a hit with me.

But when I mention Radio—
That fascinating game—
To any other lady-fair,
She'll wiggle, giggle, pout or stare
Or turn her back and fix her hair;
The poor benighted dame.

Now with you, friend, its different;
You're 'there' in every way.
When e'er talk this wireless stuff
You hold you own without a bluff
And never seem to hear enough.
That's what I call 'OK'.

And when you start to slinging code
That's when I like to be
Asittin' with my bulbs alight,
The pencil flying, phones clampt tight—
Say! I could listen half the night
When you are at your key.

Now, as I mentioned just above,
If all the girls could be
As nice as you, and use their heads
For other things than millin'ry spreads
And paint displays in creams and reds,
They'd sure appeal to me.

Johnny Clayton of 5ZL has been down with appendicitis but is now rapidly recovering and soon will be working the Canadian stations as well as ever. Here're our best wishes, Jawn.

The Magnavox Telemegafone has been redesigned for the amateur field and is now offered under the name of the Radio Magnavox at half the old price. It is built on the same electro-dynamic principle as the type R-1, the difference being in the winding and construction of the field. It operates on field currents of from 0.5 to 1.75 amperes instead of the much heavier current required by the earlier type, which means that complete saturation is no longer necessary and amateurs may run the new Magnavox on 2, 4 or 6 volts as they desire. With such a good loud-speaker at a reasonable price, we believe they will be very popular.

A competitive examination will be held beginning April 25th for the filling of 2585 vacancies in the grade of second Lieutenant in the Army, of which vacanices 114 are for Signal Corps appointments. Practically the equal of a B.S. degree in electrical engineering is required. Application blanks and further information can be obtained by request from the Commanding Officer of the nearest military post or station.

2CT, in trying to find the trouble with his round system, discovered that six feet of an exhaust pipe to which he was connected was made of rubber hose! Wasamatterwasamatter?

Chicago's twenty-two high schools are being equipped with radio. The Chicago Radio Laboratory has the contract for several of the installations.

Mr. Philip R. Coursey, Ass't Editor, "The Radio Review", 12-13 Henrietta St., London, inquires whether members of our League have heard signals from the Air Ministry's station in London, call letters GFA, and requests that anyone interested listen for these signals. Meteorological and other bulletins are broadcasted on 1400 meters, C.W., at 9:05 p.m., 3:05 a.m., 4:15 a.m., 9:05 a.m., 2:05 p.m., and 3:00 p.m. daily, Eastern Standard Time, and also at 4:35 a.m. and every hour thereafter until 1:35 p.m., E.S.T., on 1680 meters. Please report reception.

Has any QST reader constructed a satisfactory audibility meter? If so, the Editor would be very glad to have a description of its construction, as several A.R.R.L. members have recently inquired about the matter.

The Army Air Service, realizing the importance of radio, has established a school for training personnel to install and operate equipment on airplanes at the various flying fields. Their latest bulletin indicates that they are looking for help, and experienced amateurs may qualify for attendance at this school upon application to any army recruiting officer or to the office of the Chief of Air Service, Washington.

"Salvaged" Air Service headsets built in a helmet come in pretty handy when an amateur operator is troubled by what is known as "domestic QRM".

There are two methods of securing a sufficiently negative bias on a detector grid to make the tube operate right: either the use of a battery or drop across the filament rheostat to directly polarize the grid, or the use of a grid condenser and leak which accumulates electrons collected by the grid and permits their leakage at a definite rate and so establishes a definite bias. While either method may be used satisfactorily on undamped signals, we wish to point out that for the reception of spark signals the advantage is altogether with the condenser-and-leak method. Where the bias is obtained by an impressed

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potential, the tube detects because of the bend in the characteristic curve, while with the condenser the action occurs thru an accumulating charge from the rectified oscillations of the incoming wave train and will take place at any place in the curve and has a much greater effect on the plate current than simple operation at a bend in the curve.

In certain gaseous tubes no leak across the condenser is required. This is because in such tubes the charge leaks off thru the electrode supports within the tube or is given up by ionization.

Gems from examination papers of a radio instructor in an army school during the war:

"Audion: A glass bulb filled with vacuum".

"Logarithmic decrement is the appearing logarithm" ... etc., for "Naperian". "Decrement is caused by corona", which may be truer than he knew.

"The telephone is composed of a hard rubber coating. Inside this coating is a diaphragm made of some special kind of rubber, which is acted on by a permanent horse magnet".

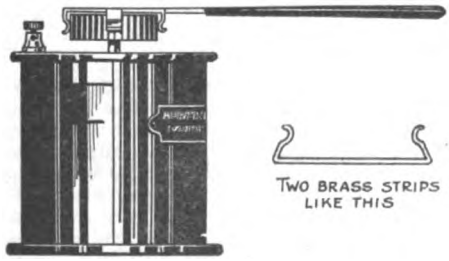
"The specific gravity can be found by the use of a galvanometer".

E.M.F.: "Electrive Motor Force".

References to "hot wave meter", "hot air ammeter", "cat-tail detector", "Lydite" as a rectifying mineral, etc.

At the St. Louis Convention Mr. M. B. West started us all thinking with a number of startling ideas on spark transmission. There are many things that we don't fully understand in our operation, and our conventions are excellent places to discuss these things. In September we are going to have a big national convention in Chicago. Can't we get up a list of our problems in time to arrange for talks on these subjects by qualified men? We can, if you fellows will submit the questions to QST.

9AMU sends us this idea for a long removable handle for a condenser. Two



strips of spring brass are bent to grip the knob, and a handle may be made of thin bakelite or wood.

WOULDN'T IT BE WONDERFUL—

If it didn't take people so long to learn not to call everybody they hear?

If your best girl was an operator and nobody but you could understand her?

If the other guy seemed to need his sleep worse than you did, and would go to bed instead of sitting you out?

If we could go to a meeting of the I.R.E. and get some actual constructional details instead of being drowned in a sea of higher math?

If those .05 decrement, 600 meter transmitters were not heard on 200?

If all income spent on radio apparatus was exempt from income tax?

If these DX birds who call fifteen times would sign off before they fade?

If 3YG wouldn't break up Arlington's weather report with his QST?

If the Fifth District would have a convention?

If 9UQ would give music lessons with that rotary?

If all relay messages were handled as quickly as the Transcons!

If some of our fone stations would play their music to *themselves* for a change? (Amen!)

If 2DR would stop calling nines long enuff to see what's happening on the air?

If all newspaper reporters took interest in amateur wireless and reported results with the same accuracy that S. W. Smith of the Hartford Courant does?

If 5ZP could explain how he gets six thermo-couple amperes on ½ k.w.?

If 6CH and 6OC would stop arguing about which one causes the most QRM in Los Angeles?

If 1JQ and 1UAV were pinched for carrying concealed bricks?

If Grebe would give a regenerative receiver for fifty soap wrappers? (But what bug finds time to wash?)

If 3IY would go to work?

If a pair of Murdock phones could be put on with one hand?

If oatmeal was put up in Bakelite boxes?

If a hairdresser could give a radio set a permanent wave (sharp one, we mean)?

If Bakelite didn't smell like a hospital?

If amateur stations in general and 3DH, 3AHK and 8ARW in particular would take a nap during church services from KDKA and give the parson a chance to get *his* traffic thru?

If compensated CW artists would tune to maximum with closed key, so their backwash wouldn't be so many times more QSA than their signal?

If 1HAA could hear all the stations he broadcasts traffic to?

If Brother A. L. Groves could have a transmitter?

If we all had time-pieces as accurate as 3AOV?

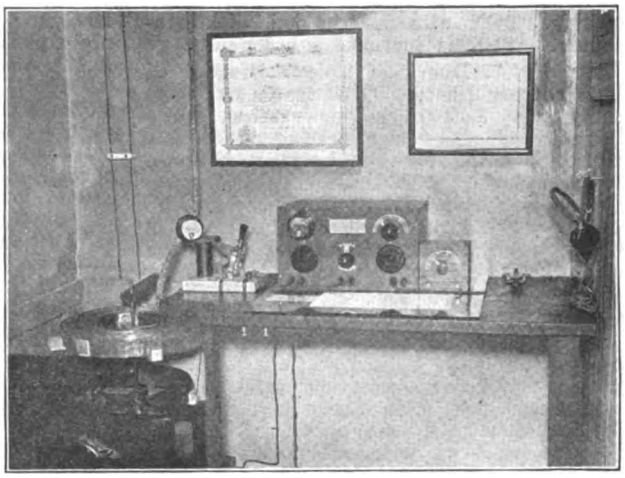
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2SZ, TROY, N. Y.

(Concluded from page 40)

night, the Chief Operator being E. M. Williams, and the others L. S. Inskip, J. A. Lynd, and D. H. Harris, all students at Rensselaer Polytechnic Institute.

In fifty nights of operation, with a single tube, over 300 DX stations were copied, 9LR being the farthest, and 100 DX stations were worked, 9JN, Ames, Iowa, being the most distant.



OUR GOAT.

(Concluded from page 26.)

knew for a fact that there were hundreds of you chaps on and just itching to work. But you did not, and we put the biggest thing across that has ever been attempted in amateur radio. It was just thrilling, and entirely aside from the superb engineering feat represented it was a demonstration of ORGANIZATION and that good old A.R.R.L. SPIRIT of co-operation. It was perfectly splendid, and when anybody says he never heard of the A.R.R.L. it gets our goat.

THE OPERATING DEPARTMENT.

(Concluded from page 33.)

handling the bulk of message traffic in this District are 9HR, 9FS, 9ALY.

Mr. R. D. McCommon, D.S. of Eastern Ohio, has been endeavoring to line up C.W. stations for C.W. relay routes to various parts of his district. Several stations in this territory are equipped with excellent tube transmitters. Among these are 8FD, 8JU and 8ZG.

Mr. McCommon is laying plans for summer daylight routes and at present is in need of a good station to relay between 8FD and 8ZE. Stations so located as to be suitable for this purpose are requested to communicate with Mr. McCommon.

Cleveland, Ohio, has been working very hard to perfect an organization and has succeeded in wonderful style. During the first fading tests a report was received from the Bureau of Standards to the effect that absolutely no curves of any value were received from Cleveland because of the local interference situation there. Since that time the situation has steadily improved by the efforts of Mr. A. J. Spiller, Mr. F. M. J. Murphy, Mr. J. W. Speer, Mr. R. N. Stoddard and other prominent Cleveland amateurs. A plan of traffic handling somewhat similar to that followed in Chicago has been drawn up and put into effect with a strong radio club to back it and the results have been excellent. In adition to improving local conditions the Cleveland radio men have been conducting a campaign in the interests of public opinion. Several interesting demonstrations have been given, the most unusual one being a radiophone concert with an aerial formed of the audience holding hands. This stunt was pulled off by C. J. Carter, 8AGZ, Mr. Speer, Mr. Spiller and Mr. Stoddard and attracted much attention. Message reports from Cleveland show a big increase in the amount of long distance traffic handled which is unquestionably due to the improvement of local conditions.

The District of Kentucky is showing more pep every day as is evidenced by the number of messages now going through this District regularly. We can remember the time when Kentucky was considered the dead spot of the Central Division but this is certainly not the case now. Mr. J. A. Kolb, the D.S. reports the following: Newport, Ky., C. M. Hengelbrok, 9IO, will have a C.W. set in operation in the near future. 9AVF has been working DX but his business handicaps him. 9APZ is reconstructing his transmitter and will be heard soon. Covington, Ky., A.D.S. Brown, 9UH, never sleeps and has done heaps of relaying. C. M. Kleaman, 9VZ, is in the ether again and has done some real DX. 9AIR has had trouble with the power company but has had a special line installed. 9APS has excellent equipment.

Louisville, Ky., 9OX, has been working consistently and had done some real DX but is out for the present with Dubilier

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trouble. 9GX also is troubled with condensers. 9LK is increasing his power.

Mr. K. A. Duerk of Toledo District of Ohio reports Eastern Ohio traffic has been going via 8ZR from his station, while Detroit traffic has been getting off in fair shape, it being possible to QSR through 8LV at Ann Arbor. Some Toledo traffic has gone in via 8AHI at Toledo, but as he is on only irregularly, the USM route is still in use. All traffic in other directions goes off without any delay.

Mr. and Mrs. Chas. Candler, Superintendents of the Miami Valley District of Ohio, report that traffic both within the district and with distant stations has been moving with even greater activity than heretofore. 8ZL is in direct daylight communication with all points within the District as well as with all points of the Toledo district and connects easily in daylight with all surrounding Districts.

8FT is not allowed to transmit before 10:30 p.m. nor after 5:30 a.m. 8TN was out of commission for a large part of the month because of condenser trouble. He is now ready again to go ahead next month full blast. 8AKV is very much handicapped with QRM from Cincinnati, but does fine work. 8AEY, Merril T. McColm, 448 Silver St., Lebanon, Ohio, has been appointed official relay station for Lebanon, Ohio.

Mr. C. E. Darr, District Superintendent of Michigan reports no material change in traffic routing or handling in his state, traffic being disposed of in the same chanels as usual. Several of our relay stations in Toledo, on whom we depend greatly, have not been in operation lately on account of disabled apparatus. 8ZZ has not been in operation for six weeks on account of heavy induction. We have a new special station in Lansing, 8YG, Michigan Agricultural College.

Mr. Schlaak, 8OJ, A.D.S. of Michigan reports traffic moving with a businesslike regularity the last month although we are still in need of stations in the north and northwest part of the district, in the vicinity of Grand Rapids and Bay City. And what has happened to our friends in Toledo?

Mr. Burhop, 9ZL, reports traffic moving as usual over the North Shore routes.

Taken as a whole the general condition in the Central Division has been improving steadily and especially is this true with the advancement of C.W. transmission into more general use. More consistent communication may be carried on through certain kinds of interference by this means and accordingly extensive C.W. routes are being planned to work in harmony with the regular spark routes throughout the Division. The first of these routes is in nightly operation from 11:30 P.M. to 1:00 A.M. central time and runs from 9XI to 9XM to 9ZN to 8ZG from which station Pittsburgh and New York C.W. connections are made. An attempt is being made to connect this route with stations farther west and since 7XD at Billings, Mont., is installing a tube transmitter it is believed that an effective and consistent C.W. transcontinental route will soon be in operation which in combination with the existing spark relay routes should give wonderful communication.

Total messages 3270. Busiest station 8IK=302 msgs.

DETERMINATION OF RESISTANCE

(Concluded from page 36)

grounded to the negative filament terminal of the audion and to Corner 2 of the bridge.

For audio frequencies the same detector circuit will do but the audion must be non-oscillating, only regenerative, by loosening the plate-to-grid coupling. When the impedances to be measured do not exceed about 1000 ohms, an ordinary pair of wireless phones attached to the high-tension winding of a modulating transformer, with the low tension winding across corners 3 and 4 will make a very sensitive detector, for audible frequencies and free from interference.

For best results, in the detector the primary circuit L_1 C_1 should have for a given frequency a small L and high C, and the secondary, L_2C_2, a high L and low C in order to increase the ratio of transformation from secondary to primary. The low L and high C in the primary will also secure maximum sensitiveness from the bridge itself, which takes place when the impedance of the detector is equal to that of the arms. Usually for a good coil with a resonating condenser across it, the effective impedance is very much larger than the arms of the bridge. The bridge may be used to determine a given frequency with great accuracy. A standard condenser and inductance in a resonating bridge like in Fig. 3 when balanced will give the frequency

$$F=\frac{1}{2\pi\sqrt{LC}}.$$

The detector may thus be calibrated for frequency and become an accurate wave-meter.

Thru error the cuts in the advertisement on page 100 of this issue, were transposed.

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Calls Heard



HEARD DURING FEBRUARY

Unless Otherwise Specified

In addition to the following instructions please read references to this section on pages 30 and 58 in February QST.

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

If you will co-operate with us in this, no calls published will be over two months old, and their value will be greatly increased in that we can keep tab on how improvements in our transmitters are working out, etc. It will be our aim to publish representative lists, equally distributed over the country; and in general to conduct this department so as to be of the highest possible service.

Heard at Sea.

S.S. "City of St. Joseph", 900 m. S.E. Cape Henry Va., 1HAA, 2EL, 8XE. 280 m. S.E.: 1CZ, 2BM, 2FG, 2QR, 2UK, 2DR, 3CC, 3AL, 5XA, 8XE, 8BC, 8IK, 8KL, 8RP, 8ZD. 70 m. S.E.: 1YB, 1HAA, 3DH, 3DN, 3GO, 3IX, 3JN, 3RK, 8XR, 8ZD, 8ZL, 8BP, 9ZL.

NRJ at Portland, Me., Feb. 22: 2DN, 2JJ, 2OA, 2RK, NSF, 3ACM, 3DH, 3HG, 3NB, 8HG, 9ZL.

KEJX between N. Y. and Baltimore, galena: 1RAY, 1HAA, 2FG, 2OU, 3EN, 4BY, 8DR, 8DZ, 8TT, 8QJ, 8AGK, 8JL, 8AMM, 8ARW, 8CAA, 8KP, 9LQ, 9HN, 9NJ, 9XW, 9AJN.

U. S. Marines Stn., Manati, Ouente, Cuba, January: 2RK (loudest), NSF, 5XB, 5ZC, 8ZL, 8ZR, 9ZJ (most consistent.)

KOBT enroute N. O. to Havana: 2JU, 3BZ, 3DH, 3EN, 3FG, 3GO, 3VV, 3XF, 4AG, 4AI, 4BK, 4BY, 5BI, 5ER, 5HV, 5HL, 5IS, 5JE, 5KP, 5JD, 5PM, 5ZA, 5ZC, 5ZP, 5ZS, 5ZU, 8AV, 8IK, 8NZ, 8SP, 8ZL, 8AAZ, 8AEX, 8ANJ, 9EL, 9EQ, 9HI, 9JN, 9JQ, 9LF, 9LQ, 9PS, 9XM, 9ZB, 9AEG.

1RAY UNIVERSITY OF VERMONT, BURLINGTON, VT.

1AAG, 1AE, 1AO, 1AS, (1AW), 1BAB, 1BAC, 1BB, (1BBL), 1BGR, 1BM, 1BY, 1CC, 1CK, 1CY, (1CZ), (1RAC), 1DH, 1DT, 1DY, 1DZ, (1EAT), 1EAV, (1EK), 1ER, 1FBV, 1FK, 1FU, 1FV, (1GBC), 1GBT, 1GY, (1HAA), 1IA, (1JA), (1LAX), (1LBR), (1MAD), (1MBS), 1NAQ, 1OE, 1OY, (1PAO), 1PY, (1RAS), 1SA, 1TA, (1TS), 1TX, 1UA, 1UD, 1VAA, 1XB cw., (1XT), 2AA, (2ACD), (2ADE), 2AEL, (2AJW), 2ALD, 2ALK, 2AR, 2AWL, 2BG, (2BGR), 2BK, 2BM, 2CC, 2CT, 2DA, (2DI), 2DR, 2EH, (2EL), 2IL, 2JJ, (2JU), (2KM), 2ML, 2NW, 2OA, (2OM), 2RK, 2SH, 2TE, 2TJ, (2TK), 2UC, 2UK, (2VA), 2XJ, 2XQ fone, 2YM, 2ZM, 3AAG, 3ACE, 3ACT, 3AER, 3AH, (3AIC), 3AK, 3AL, (3BG), (3BP) Canadian, 3CC, 3CE, 3DA, 3DD, 3DDS, (3DH), 3EE, 3EH, (3EN), 3EY, 3FB, (3GO), 3HB, (3HJ), 3HX, 3IL, 3IX, (3KM), 3LI, 3LR, 3MB, 3MZ, (3NB), 3OE, 3OM, (3OU), (3PS), (3PU), (3QW), 3RW, (3TJ), 3UC, 3UU, 3XF, 3ZE, (4A), 4BQ, (4EY), 4FD, 4YB, 5DA, 8AD, (8AFB), 8AFG, 8AGD, 8AGK, 8AGO, 8AHR, 8AIO, 8AJ, 8AJO, 8AJI, 8AL, 8ALE, 8AMF, 8AMJ, 8AMQ, 8AMZ, 8AWX, 8BO, 8CF, 8CG, 8DC, 8DH, 8DP, (8DR), 8DV, (8DZ), 8ED, 8EV, (8FAA), 8FE, 8FI, 8FW, 8GB, (8GI), 8GO, 8GY, (8HG), 8HJ, 8HN, 8HP, 8HQ, 8HY, 8IG, 8IL, 8IZ, (8JE), 8JQ, 8KE, 8KK, (8KP), 8KZ, 8LH, 8MAO, 8ML, 8NZ, 8OY, (8OZ), 8PQ, 8PU, 8PW, (8QJ), (8QM), 8RE, 8RP, 8RQ, 8RW, (8SP), 8TT, 8OU, 8WP, 8WY, 8XA, (8XE), (8XG), 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8ZJ, 8ZL, 8ZQ, (8ZR), (8ZT), 8ZW, 8ZY, 9AEK, 9AFA, 9AFK, 9AIX, 9AWX, 9BL, 9DP, 9ET, 9FN, 9FS, (9GP), 9JN, 9KL, 9LA, 9LK, (9LQ), 9MC, 9PC, 9PO, 9SQ, 9WC, 9WO, 9WU, 9XM, 9YA, 9YB, 9YW, 9ZD, 9ZJ, 9ZL, 9ZN, 9ZQ.

1UD, DUXBURY, MASS.

1AB, (1AE), 1AW, 1AS, 1BAX, 1BB, (1BH), 1BV, (1BW), (1CBD), 1CF, (1CK), 1CP, (1CZ), 1DBM, (1DBU), 1DH, (1DR), 1FZ, (1DY), (1EAV), (1EBW), (1EP), (1ES), 1EV, 1FBT, (1FBV), 1FC, 1FF, (1FU), (1FV), 1FW, (1GBG), (1GBL), (1GBT), 1GM, 1GZ, (1HAA), 1HAI, (1HAK), (1HAL), 1HF, 1HN, 1IA, 1IE, (1ID), (1IS), (1JBT), 1JG, 1KAG, 1KM, 1LAX, (1LBR), 1MAD, (1MAU), 1MBE, 1MF, 1NAQ, 1OA, 1OE, 1PAO, (1PAT), (1PAW), 1PBE, (1PU), 1QR, (1RAY), (1RV), 1SAS, 1SAF, 1SD, 1SS, (1TS), 1UC, 1UE, (1UL), 1UM, (1UN), (1VAA), 1VY, 1WJ, 1WQ, 1WR, 1XB, 1XE, 1XF, 1XM, (1XT), (1XX), (1YB), 1YC, 1YS, 2AAC, 2AAE, 2ACM, 2AE, (2AER), 2AGC, 2AHK, 2ALK, (2AM), 2AR, 2AX, 2AXB, 2BB, 2BGR, 2BGN, 2BK, 2CC, 2CT, 2DA, 2DI, 2DL, (2DN), 2EL, 2DR, 2FD, 2FG, 2FZ, (2HJ), 2HK, 2IG, 2JJ, (2JU), 2JW, 2KY, 2LO, 2NC, 2ND, 2NN, 2OA, 2OAR, 2OO, 2PL, 2RB, (2RK), 2SZ, (2TF), 2TC, (2TJ), 2TK, 2TS, (2UA), 2UV, 2VA, (2WZ), 2XJ, 2XX, 2YM, 2ZL, 2ZM, 2ZV, 3AAG, 2ABI, 3ACM, 3ACS, (3AHK), 3AIK, (3ALN), 3BP, 3BG, 3CC, 3CS, 3DR, 3DH, 3DS, 3EH, 3EI, 3EN, (3GO), 3HG, (3HJ), 3HX, 3IW, 3IY, 3KV, 3NC, 3OB, 3PN, (3PU), (3QF), 3SB, 3UC, 3VV, 3XC, 3YM, 3YV, 3ZE, 3ZM, 4AG, 4BY, 4FF, 4XC, 8AB, (8AD), 8ADQ, 8AGK, 8AIO, 8AJW, (8AMZ), 8APB, 8AR, 8ARK, (8AMM), (8BC), 8BK, 8BO, 8BW, 8CW, 8DK, 8DR, 8EV, 8FC, 8GH, 8GI, 8GX, 8HG, 8ID, 8JS, 8JQ, 8KK, 8KM, 8KP, 8KU, 8KZ, 8LF, 8LQ, 8MF, 8MG, 8MH, 8ML, 8OI, 8OY, 8OZ, 8PI, 8PN, 8PQ, 8QM, (8RQ), 8RU, 8SH, 8UU, 8VA, 8VU, (8WV), 8WY, 8XC, 8XE, 8XH, 8XX, 8ZA, 8ZE, 8ZL, 8ZJ, 8ZM, 8ZR, 8ZX, 8ZY, 9AAW, 9ET, 9FA, 9HM, 9PC, 9QL, 9WE, 9VK, 9ZJ, 9ZL, 9ZN, 9ZW.

NAF1 RADIO COMPASS STATION, PRICE'S NECK, NEWPORT, R. I., March.

1II cw, 1YK cw, 1XF cw & fone, 2JU spk, 2RM cw, 2ZL cw, 3AR cw, 3HB spk, 3MR cw, 3XI cw, 3ZA spk, 7ZZ cw, 8GB spk, 8ZG cw, 8ZW spk, 9AB spk, 9JD spk & fone, 9LJ cw, 9OX spk, 9WS spk, 9XI cw, 9ZJ spk, 9ZN spk.

1TS, BRISTOL, CONN.,—One Tube.

1AE spk & cw, 1AO, 1AR cw, 1AS, (1AW), 1BAB, (1BBL), 1BBO cw, 1BH, 1BM, (1BV) cw, 1CAY,

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1CBJ, 1CF C.W., 1CK spk & C.W., (1CM), 1CP, 1CY, 1CZ, 1DA C.W., 1DAC, 1DAP, 1DAQ, (1DR), (1DY), 1EAV, (1EBW), 1EP, (1ES), 1FAQ, 1FBF, (1FBK), 1FL, (1FQ) C.W., 1FU, (1FV), 1GAN, 1AS, 1GBC, 1GBL, 1GBT, (1GM), (1GY), 1GZ, (1HAA), 1HAF, 1HAK, 1HO, (1IA), 1IAO, 1ID, 1JAR, (1JBF) spk., C.W. & fone, 1JBT, 1JN, 1JQ, (1KAZ) spk. & C.W., (1LAX), (1LBR), 1LJ, 1MAD, 1MBS, 1MP, 1MX, (1NAQ), 1NAW, 1NO C.W. & fone, 1OAD, (1OBC), (1OBE), (1CE), (1PAO), 1PAW, 1QAJ C.W. & fone, 1QBF, 1QR C.W., 1QT, 1RAS, 1RAX, (1RAY), (1RU) C.W. & fone, 1RV, 1RX, 1RZ spk. & C.W., 1SAZ, (1UD) spk. & C.W., (1UJ), 1UN spk. & C.W., (1UQ), 1VAA, 1WAB, 1WP, 1WR, 1XD fone, 1XE, 1XM, (1XN), (1XT), (1XV) C.W. & fone, (1XX spk. & C.W., (1YB), 2AAG, 2ACD, 2AEF, 2AER, 2AJF C.W., 2AJN, 2AJU C.W., 2AJW, 2ALK, 2AMY, 2ANN C.W., 2ANZ, 2ARA spk. & C.W., 2ARD C.W., 2ARY, 2AW, 2AXB C.W., 2BAD, 2BB, 2BGH, 2BGN, 8BGR, 2BIP, (2BK), (2BM), 2BY C.W., 2CC, 2CS spk. & C.W., 2CT spk. & C.W., (2DA), 2DI, 2DN, 2DR, 2EL, 2FD C.W., 2FG, 2HI C.W., 2IN, 2JJ, 2JU, 2KR, 2KW, (2LO), 2MJ, 2NB, (2NN), (2OA), 2OM, 2OO, 2PL, (2QR), 2RB, 2RK, 2RM, 2RQ, 2SZ, 2TB, 2TF, 2TJ, 2TK, 2TS, (2UA), 2UE, 2UH, 2XK C.W., & fone, (2XQ) spk., C.W. & fone, 2XX C.W. & fone, 2ZC, 2ZD C.W., 2ZL C.W., 2ZM spk., & C.W., (3AA), 3AAE C.W., 3AAG, (3ABI) C.W., 3ABV, 3ACE, 3ACM, 3ACS C.W., 3AIC, 3AHK, 3AK, (3ALN), 3BG, 3BZ, 3CC, 3CE, 3CF, (3DH), 3EE, 3EH, 3EN, 3FB, 3FM, 3FR, (3GO), 3GX, 3HJ, 3HX, 3IX, 3IY, (3KM), 3LR, 3NB, (3OB), 3OU, 3PS, (3PU), (3QF), 3RU, 3RW, 3TJ, 3UF, (3VV), (3XF), 3YG, 3YH, 3YV, 3ZA, (3ZE), 4AG, 4CK, 4EY, 4FD, 4XB C.W., 4XC, 4YA, 5HA, 5XA, 5YH, (8AB), 8ABG), 8ACF, 8AD, 8ADE, 8ADQ, 8AEE, 8AFB, 8AFO, 8AFS, 8AGB, 8AGK, 8AGO, 8AIB, (8AIO), 8AJ, 8AJT, 8AJW, 8AKA, 8AKS, 8AKV, 8AL, 8ALY C.W., 8AMF, 8AMJ, 8AMM, 8AMQ, (8AMZ), 8ANT, 8AOF, 8AOU, 8A.PB, 8ARK, 8ARW, 8ATN, 8AVD, 8AWX, 8AXC C.W., 8AXK, 8AY, 8AYA, (8BC), 8BO, 8BP, 8CD, (8CG), 8CI, 8DP, 8DR, 8DT, (8DV), 8DY, 8DZ, 8FAA, 8FD, 8FE, 8FI, 8FK, 8FW, 8GI, 8GW, 8HA, (8HF), 8HG, 8HI, 8HP, 8HY, 8IB C.W., (8ID), 8IK spk. & C.W., 8IL, 8IN, 8IV spk. & C. W., 8JE, 8JJ, 8JM C.W., 8JQ, 8JU spk. & C.W., 8KE, 8KK, 8KM, 8KP, (8KZ), 8LE, 8LF, 8LI, 8LQ, 8LV, 8LX, (8MF), (8ML), 8MT, 8MZ, 8NV, 8NZ, 8OC, 8OI, (8OJ), 8ON, 8OZ, 8PE, 8PJ C. W., 8PN, 8QJ, 8QM, 8QQ, 8RH, (8RQ), 8RU, 8RW, 8SH, (8SP), 8TB, 8TK, 8TN, 8TT, 8UK, 8UO, 8UY, 8VJ, (8VQ), 8VS C.W., (8VU), (8VW), 8WO, (8WY), 8XA, (8XE), 8XH, 8XI, 8ZK C.W. & fone, 8XS, 8YG C.W. & fone, 8YV, 8YF, 8ZA, (8ZD), (8ZE), 8ZG C.W., 8ZL spk. & fone, 8ZR, 8ZV C.W., 8ZW, 8ZY, 8ZZ C.W., 9AAC, 9AAW, 9AEA, 9AFK, 9AFO, 9AGY, 9AIX, 9AON, 9AOJ, 9APK, 9AWZ, 9BP, 9CP, 9DBT, 9DV, 9EQ, 9GN, 9GP, 9HI, 9HJ, 9HM, 9HN, 9HP, 9HR, 9HY, 9JN, 9KA, 9KL, 9KN, 9KV, 9LA, 9LQ, 9LR, 9MC, 9MT, 9PG, 9PV, 9QO, 9SQ, 9UH, 9UU, 9WE, 9WK, 9XI C.W., 9XM spk., C.W. & fone, 9YB, 9YC, 9YI, 9ZA, 9ZB, 9ZJ, 9ZL, 9ZN spk. & C.W., Canadian (2AK), (2CI), 3AO (3BO), 3EI, (NSF) C.W. & fone.

1NY, BELMONT, MASS.

1AB, 1AE, 1AS, 1AW, 1BBBD, 1CK, 1CY, 1CZ, 1DR, 1DY, 1EP, 1EBW, 1EV, 1GAW, 1GBT, 1IE, 1IC, 1JBT, 1PD, 1PAW, 1QT, 1RAY, 2BK, 2EL, 2JJ, 2JU, 2OM, 2OO, 2RK, 2SZ, 2TF, 2XQ, 2XX, 2ZL, 3AL, 3ACM, 3AHK, 3CC, 3DH, 3EN, 3GO, 3HG, 3HX, 3NB, 3VV, 8AD, 8AFB, 8AGK, 8AI, 8AWX, 8DR, 8DV, 8EC, 8FK, 8GI, 8HG, 8ID, 8JJ, 8KK, 8KZ, 8MZ, 8NZ, 8WY, 8XE, 8XU, 8ZE, NSF.

2AIH, BRONXVILLE, N. Y.

1AW, 1DR, 1FVS, 1HAA, 1HBA, 1RK, 1RAS, 1RAY, 1RR, 1TS, 1VAA, 1XF, 1YB, 2AEF, 2AJE, 2AJP, 2AJT, 2AKO, 2ALW, 2AM, 2AMI, 2ANZ, 2APF, 2AQI, 2AST, 2AVR, 2AZ, 2BAI, 2BB, 2BEY, 2BF, 2BFL, 2BGD, 2BIS, 2BK, 2BM, 2CC, 2CT, 2CY, 2DK, 2DN, 2FG, 2HJ, 2HZ fone, 2HQ, 2JJ, 2JU, 2KN, 2LZ, 2NT, 2NV, 2OA, 2OM, 2OW, 2PE, 2QK, 2QY, 2RB, 2RK, 2TB. 2TK, 2UA, 2VA, 2VH, 2XC fone, 2XG fone, 2XK fone, 2XQ, 2ZM, 3AHD, 3AII, 3BP, 3BZ, 3DH, 3EN, 3GG, 3GX, 3HG, 3HJ, 3NB, 3PU, 3ZE, 4MI, 4XC, 8AB, 8ACF, 8AE, 8AGH, 8AIO, 8AJW, 8AJT, 8AKJ, 8AKV, 8AMM, 8AMZ, 8AU, 8BC, 8BO, 8CD, 8CG, 8CH, 8DC, 8DR, 8FA, 8FC, 8FN, 8FT, 8GI, 8GO, 8HA, 8HP, 8ID, 8IK, 8JE, 8JJ, 8JL, 8JQ, 8JU, 8KB, 8KM, 8LF, 8LQ, 8LV, 8ME, 8NT, 8NZ, 8QJ, 8RQ, 8RU, 8RZ, 8SH, 8SP, 8TK, 8TN, 8TT, 8TY, 8VQ, 8WO, 8WY, 8XE, 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8ZY, 9AAC, 9AIK, 9AKH, 9AON, 9CP, 9EB, 9EY, 9HN, 9HT, 9JN, 9LA, 9LQ, 9OE, 9PW, 9UU, 9ZL, 9ZN, NSF.

2TT, NEW YORK CITY.

1AE, CW., 1AW 1BBL, 1BM, 1CK, 1CP, 1CZ, 1DY, 1EBW, 1FV, 1HAA, 1MAD, 1OE, 1TS, 1RAY, 1UD, 1VAA, 1XX, 1YB, 3ABI I.C.W., 3ACM, 3ACS, 3AHK, 3AIC, 3AK, 3ALN, 3BG, 3BZ, 3CC, 3DH, 3EN, 3FR, 3GO, 3GX, 3HG, 3HJ, 3HX, 3IY, 3LY, 3NB, 3OB, 3PU, 3VV, 3YV, 4XC, 5YE, 8AD, 8ADE, 8AFO, 8AGK, 8AGO, 8AIO, 8AJW, 8AKA, 8AKV, 8AL, 8ATN, 8BC, 8BO, 8OF, 8DR, 8DV, 8EB, 8FE, 8FK, 8FT, 8GW, 8HA, 8HF, 8HH, 8HG, 8HO, 8ID, 8IK, 8IV, 8JE, 8JF, 8KK, 8KP, 8KZ, 8LQ, 8MF, 8MZ, 8OI, 8RU, 8SP, 8UK, 8UY, 8VJ, 8VQ, 8WY, 8ZE, 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8ZGQ C.W., 8ZL, 8ZR, 8ZW, 8ZY, 9AAW, 9EQ, 9JN, 9KN, 9MH, 8SQ, 9UH, 9WE, 9XM spk. & C.W., 9XI C.W., 9YB, 9ZL, 9ZN, NSF, Can. 3BP.

2PL, MAPLEWOOD, N. J.

1BAB, 1BBL, 1CY, 1CZ, 1DL, 1DY, (1EAV), 1GY, 1HAA, 1Q, (1RAY), (1VAA), (1XT), 2ZL, 3AB, 3ACE, (3EN), 3FG, 3GO, 3GX, 3HB, (3HG), 3KM, 3NB, 3SW, 3UC, (3VV), 4BY, 4DM, 4EY, 8AAZ, (8AMZ), 8AI, ((8AIO), (8BO), 8BP, 8CD, 8CM, 8DI, 8DJ, 8ED, 8ER, 8EV, (8FE), 8FK, (8FT), (8GI), (8GW), (8GX), 8HG, 8HP, 8IZ, 8TS, (8KK), (8KM), (8KP), 8LW, (8MH), (8ML), 8NI, 8QJ, (8RQ), 8RW, 8SH, (8SP), 8TN, 8TT, (8WY), 8ZL, 8ZD, 8ZL, 9ANZ, 9AP, (9BP), (9EL), 9GP, 9LQ, (9PV), 9ZL.

2AUG, RIDGEWOOD, N. J., Indoor Aerial.

1AW, 1AE, 1DR, 1DY, 1EP, 1GM, 1GY, 1GZ, 1HW, 1LA, 1OE, 1UD, 1UT, 1EBW, 1GBL, 1HAA, 1RAY, 1VAK, 1XD, 1XX, 3BP Canadian, 3DH, 3DS, 3EI, 3GO, 3HG, 3KM, 3NB, 3UC, 3VH, 3VV, 3ABC, 3AHK, 3ALN, 4EY, 4XC, 5YH, 5XA, 8AD, 8AL, 8BC, 8BP, 8FC, 8FK, 8FQ, 8GI, 8HY, 8HJ, 8HP, 8HQ, 8HY, 8ID, 8IK, 8IU, 8JJ, 8JL, 8JQ, 8KE, 8KK, 8KM, 8KN, 8KP, 8KU, 8LF, 8LM, 8LQ, 8LV, 8MT, 8OJ, 8PL, 8PN, 8RU, 8SH, 8JJ, 8TK, 8TN, 8UY, 8VJ, 8WY, 8XE, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8AAX, 8ACF, 8ADE, 8AGK, 8AJB, 8AJW, 8AKV, 8AMK, 8AMM, 8AMW, 8AOF, C.W., 8AXC C.W., 8AYY, 8FAA, 9CP, 9DV, 9EQ, 9FG, 9GP, 9HM, 9HN, 9HP, 9HR, 9JK, 9JN, 9JQ, 9KN, 9KO, 9LA, 9LQ, 9LR, 9LW, 9MH, 9NV, 9TK, 9UU, 9ZB, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZV, 9AAW, 9AEG, 9AIX, 9AOA, 9DBQ, 9NHN, NSF, WL 2 C.W.

3FB, ATLANTIC CITY, N. J.

1AE, 1AS, 1AW, 1BBL, 1CK, 1DY, 1GBC, 1HAA, 1JG, 1JBT, 1MAD, (1OE), 1OJ, 1RAY, 1XT, (1YB), 2AER, (2AJW), 2ALK, 2BM, 2BK, (2BGR), 2CC, 2CT, 2DA, 2DI, 2DN, 2DR, (2EL), 2FG, 2JJ, (2JK), (2JU), 2KR, 2OA, (2OE), 2OM, 2RK, (2SU), 2SZ, 2ZL, 3AAN, 3ALN, 3AOE, (3AS), (3BA), 3BG, 3BP, 3BZ, 3CC, (3DH), 3EN, 3GO, 3HG, 3HJ, 3IX, 3JC, 3KM, 3NB, 3OU, (3OQ), (3PU), (3SC), (3TH), 3UF, NSF, VMI, 4EY, 8AAW, 8ACF, 8AGK, 8AGB, 8AKA, 8AIO, 8AMQ, 8ANW, 8APB, 8AOU, 8AWK, 8AWX, 8BC, 8CH, 8DV, 8EF, 8FC, 8FK, 8FAA, 8GI, 8GW, 8HA, 8HP, 8IK, 8JU, 8JQ, 8KK, 8LX, (8QJ), 8RW, (8SP), 8TT, 8VQ, (8WY), 8XK, 8XE, 8XU, 8ZE, 8ZL, 8ZR, 9CP, 9ACL, 9AGY, 9DV, (9FQ), 9GP, 9JT, (9KL), 9UU, 9QP, 9ZN.

3CA, ROANOKE, VA.,

1HAA, 1LBR, 1RAY, 1RZ, 2ALK, 2BM, 2DA, 2OA, 2OO, 2TQ, 2VA, 2ZC, 2ZM C.W. & spk., 2XQ, 3AAE C.W., 3ACE, 3ACS, 3AHK, 3AOV, 3BG, 3CC, 3DH, 3EH, 3FR, 3GO, 3GX, 3NB, 3PU, 3QW, 3TN, 3ZO C.W., 4BK, 4DJ, 4EK, 4XC, 4YB, 5YH, 8ACF, 8AEY, 8AKD, 8ALG, 8AP, 8ARW, 3AY, 8AYA, 8BP, 8CU, 8FC, 8HA C.W., 8HF, 8IK,

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8IM, 8IZ, 8JQ, 8KE, 8KP, 8LM, 8LN, 8NM, 8NQ C.W., 8NZ, 8OJ, 8OM, 8SP, 8TN, 8TT, 8VY, 8VZ, 8WV, 8WY, 8XA, 8XE, 8XY, 8YK, 8YV, 8ZA, 8ZE, 8ZG, 8ZH, 8ZL, 8ZR, 8ZT, 8ZV C.W., 8ZX, 9ABL, 9CB, 9EA, 9FS, 9GN, 9GX, 9HN, 9LQ, 9MC, 9OE, 9SQ, 9XE, 9YC, 9ZB, 9ZL, 9ZM, 9ZQ, 9ZY.

3RF, HADDON HEIGHTS, N. J.

1EAV, 1HAA, 1RAY, 1XD fone, 2BM, 2DA, 2EL, 2JJ, 2OO, 2PL, 2RZ, 2SH, 2SZ, 2XJ fone, 2XQ, 2XX fone, 2ZL C.W., 2ZM C.W., 3AK, 3AR C.W., 2AAA, 3ABG, 3ACS, 3AHK, 3BG, 3BK, 3BP, 3BZ dalite, 3CC, 3DH, 3EH, 3EN, 3FC, 3FR, 3GO, 3HG, 3HJ, 3LG, 3LP, 3NC, 3ND, 3OA, 3OB, 3PB, 3PU, 3RK, 3UC, 3YM, 3ZC, 3ZV, 4AA, 4AN, 4AU, 4BB, 4BK, 4BY, 4XC, 4YB, 5EK, 5DA, 5XA, 5YH, 8AB, 8AD, 8AY, 8AAT, 8AAU, 8ABK, 8ACF, 8ACL, 8ADE, 8AEY, 8AGD, 8AGK, 8AGO, 8AIO, 8AKH, 8ALG, 8ALO, 8AMZ, 8ANB, 8ANY, 8ARW, 8AUS, 8BP, 8CA, 8CH, 8CM, 8DC, 8DJ, 8EE, 8FC, 8FD, 8FI, 8FS, 8GB, 8GH, 8GI, 8HA, 8HG, 8HM, 8HW, 8IK, 8IM, 8JE, 8JI, 8JJ, 8JQ, 8KE, 8KP, 8LK, 8LQ, 8LU, 8LV, 8MF, 8ML, 8NM, 8OJ, 8PI, 8PN, 8PW, 8QJ, 8RA, 8RQ, 8RU, 8RW, 8SH, 8SP, 8TG, 8TN, 8TT, 8UH, 8UY, 8VQ, 8WY, 8XE, 8XH, 8XK spk. & C.W., 8YV, 8ZA, 8ZD, 8ZL, 8ZI 8ZQ, 8ZR, 8ZS, 8ZW, 8ZX, 8ZY, 9AU, 9AY, 9AAF, 9ABL, 9AEG, 9AKM, 9ALK, 9ALS, 9ANN, 9AON, 9ASJ, 9AWX, 9CP, 9DK, 9EQ, 9ET, 9FA, 9FG, 9FK, 9FQ, 9FS, 9GN, 9GP, 9HG, 9HR, 9JN, 9LN, 9LQ, 9LS, 9MC, 9RZ, 9UH, 9VC, 9VS, 9XM, 9XW, 9YA, 9ZL, 9ZN, 9ZQ, 9ZR.

3IL, WASHINGTON, D. C.

1AN, 1AT, 1AW, 1BBL, 1CP, 1DR, 1DY, 1HAA, 1JBT, 1MAD, 1OE, 1RAY, 1TS, 1YB, 2BB, 2BG, 2BM, 2CT, 2DA, 2DU, 2DR, 2EL, 2FG, 2JJ, 2JU, 2OA, 2GR, 2RK, 2WE, 2WK, 3AHK, 3BZ, 3CC, 3EN, 3GO, 3HG, 3HJ, 3NB, 3PS, 3UC, 4XC, 4YB, 5XA, 5ZL, 8BC, 8EC, 8GI, 8SH, 8SP, 8SX, 8TS, 8PE, 9MC, 9UH, 9ZN.

3EN, NORFOLK, VA.

1AE C.W., 1AS, 1AW, 1BAB, 1CK, 1CY, 1FV, 1GBT, 1HAA, 1JAP, 1MAD, (1RZ), (1RAY), 1XT, 1YB, 1YBT, (2AID), 2AR, 2BK, 2BM, (2CT), (2DA), (2DN), (2DR), (2EL), 2FG, 2JJ, 2JL, (2JU), 2JZ, (2NX), (2OA), 2RB, (2RK), 2RL, 2SH, 2SZ, 2TF, 2TS, (2UA), 2UK, 2VA, 2ZL C.W., (2ZM), (3AAE C.W.), (3ABC), 3AC C.W., 3ACS, (3AHK), 3AIC, (3AR), (3BG), 3BP, 3CC, 3DH, 3GX, 3HB, 3HG, (3HJ), 3HX, 3IB, 3JC, 3NB, 3PU, 3QW, 3TJ, 3ZF, (3YV), (NSF C.W. & fone), (4AG), (4AU), (4BY), (4CK), (4FD), 4BK, (4UF), 4XC, 4YB, 5DA, 5ER, 5OE, 5XA, (5ZP), 8AAIE, 8ACF, 8ACH, (8ADE), 8AEE, 8AEY, 8AFO, 8AG, 8AGK, 8AGO 8[illegible], 8AJW, 8AK, 8AKV, 8AL, (8ANK), 8ARW, 8AY, 8AXC C.W., 8BP, 8DR, 8DV, 8DY, 8DZ, 8EV, 8FAA, 8FT, 8GB, 8GI, 8GW, 8HA, 8HG, 8HP, (8ID), 8IK, 8IW, (8IV), 8JE, 8JJ, 8KK, 8KL, 8KM, 8KP, 8KZ, (8LH), 8LQ, (8LU), (8LV), 8MF, (8ML), 8MZ, (8NZ), (8OJ), 8QJ, (8RQ), (8SP), (8TN), (8TT), 8UT, 8UY, 8VJ, (8VQ), 8VU, (8WY), (8XE), (8XH), 8XS, 8XU, 8ZA, (8ZE), (8ZD), 8ZG C.W., (8ZL), (8ZR), (8ZT), (8ZV C.W. & fone), (8ZW spk. & C.W.), (8ZY), 8YG C.W., 8YK, 9AAC, (9AAV), 9AAW, 9AWF, 9BB, 9CA, 9DBT, 9EQ, 9ET, 9GP, 9HJ, 9HN, (9JT), 9JV, 9KL, 9KO, (9KV), 9LO, 9LQ, 9LR, (9MC), 9MO, 9OR, 9OX, 9SQ, 9SU, (9UH), 9UJ, 9VC, 9WE, 9WW, 9XM, 9XW, 9YA, 9YB, 9ZL, 9ZN, 9ZV.

4EG, WOODRUFF, S. C., Jan. 22-Feb. 22.

1AK, 1AW, 1EK, 2EL, 2EP, 2ER, 2SJ, 3BZ, 3DE, 3EN, 3GO, 3GZ, 3KM, 3ND, 3RK, 4AD, 4AG, 4AM, 4AN, 4AO, 4AT, 4AU, 4AX, 4BK, 4BA, 4BY, 4CU, 4DJ, 4DU, 4EF, 4EK, 4EY, 4FD, 4XC, 5DA, 5EN, 5ER, 5GX, 5JA, 5JD, 5LA, 5ZD, 8ACF, 8AE, 8AG, 8DE, 8DP, 8DR, 8DZ, 8EL, 8FG, 8HE, 8JD, 8OP, 8RG, 8SP, 9UY, 8XE, 8XK, ICW, 8YF, 9ZZ, 9AS, 9ADR, 9AMK, 9ASF, 9GL, 9JE, 9JY, 9KR, 9LM, 9NR, 9OE, 9QC, 9UF, NSF.

4BI, MAIMI, FLA.

1CZ, 1DY, 1OX, 1WR, 2DA, 2EL, 2JJ, 2JU, 2RK, 2ZL, 3AA, 3AAG, 3AC, 3AG, 3EN, 3GO, 3ND, 3PM, 3PU, 4AC, (4AM), (4BH), (4ES), (4FD), 4BY, 5OA, 5XA, 55XB, 5ZD, 5ZO, 8ZE, 8XE, 9XE, NSF, XK1, KF1.

5XA, AUBURN, ALA., Jan. 18-Feb. 19.

1AW, 1XP, 2CC, 2DN, 2EL, 2GO, 2HX, (2RK), 2ZL, (3AH), 3AO, (3BZ), (3EN), (3GO), (3VV), 3XR, 4AG, 4AN, 4AU, 4BK, (4BY), 4FD, (4YA), (4YB), (5BC), 5BK, 5BO, 5BR, 5CG, 5CK, (5DA), 5DI, 5DW, (5EJ), 5ER, 5FA, 5FD, (5HL), (5HV), 5IK, 5IS, (5JD), 5KP, (5LA), (5LR), 5LS, 5LY, (5MF), (5YE), (5YH), 5ZA, 5ZD, 5YI, (5ZK), (5ZP), 5ZX, 8AAL, (8ANO), 8AX, 8DC, 8DR, 8DZ, (8EB), 8FT, 8GW, 8HM, 8KP, 8RE, 8RQ, 8QJ, 8SP, 8UI, (8UY), 8ZJ, (8ZL), 8ZR, 8XE, 9ABH, 9ABL, 8ACL, (9AEG), 9AGG, (9AON), 9ARQ, 9AWR, 9AWX, 9BE, (9CE), 9EE, (9EL), 9ET, 9EHL, 9HI, 8JC, 9JE, (9FU), 9KL, 9KN, 9KO, 9LF, (9LA), (9LQ), (9LR), 9LZ, 9MEQ, (9MC), 9MH, (9OX), 9QJ, (9UH), 9UK, (9UU), (9UF), (9VC), 9VZ, 9WC, 9WE, 9WW, (9ZB), 9ZJ, 9ZL, (9ZT), NSF.

5ZN, EAGLE PASS, TEXAS, Oct. 26-Mar. 4.

(5AO), 5BB, 5BC, 5BG, (5BI), 5BM, 5BO, 5CG, 5DO, 5DW, 5EA, 5ED, 5EF, 5EO, 5ES, 5EW, 5FA, 5FL, (5HL), 5HV, (5IS), (5JA), 5JD, 5JE, 5JG, 5JI, 5JS, 5JX, 5LR, 5LO, 5LZ, 5PN, 5WA, 5XB, 5YE, 5YH, (5ZA), (5ZC), 5ZD, (5ZF), 5ZG, 5ZH, 5ZK, 5ZL, 5ZO, 5ZP, (5ZS), (5ZT), 5ZU, 5ZV, 5ZX, 5ZZ, 6CO, (6GE), 6IG, 6MA, 6ZA, 7XZ, 8ZL, 9AAC, 9ABF, 9ACN, 9AE, 9AEG, 9AEQ, 9AFX, 9AHS, 9AIZ, 9AMB, 9APC, 9AJ, (9AUO), 9BJ, 9BW, 9DE, 9DU, 9EL, 9FF, 9HI, 9HO, 9JN, 9KV, 9LE, 9LC, 9LL, (9LR), 9MC, (9OE), 9OF, 9PS, 9SZ, 9WN, 9XI C.W., 9XW, 9YA, 9ZB, 9ZN, 9ZO, 9ZQ, NSF.

6ZH, Richfield, Utah,—Jan. 1-Feb. 26.

(5ZA), 5XB, 5XD, 5IF, 5BI, 5ZJ, 5ZL, 5ZP, 5JT, 5ZT, (6JT), 6ZA, (6ZM), 6EC, 6EB, (6EJ), 6ZN, (6IG), (6RE), 6JD, 6JI, 6PO, 6GI, (6MK), 6BA, (6AE), 6WV mod., (6GE), (6BQ), 6EA, 6JR, (6SK), 6KP, 6VL, (6BJ), (6EN), 6EB, 6UO, 6PR, 6KA, 6DP, 6OT, (6AK), (6VS), 6IF, 6BP, 6FH, 6IL, 6ZR, 6QR, 6AH, 6MH, 6GY, 6AJX, 6XZ, 6ZO, 6PQ, 7EX, 7YA, (7ZJ), 7CC, 7LN, 7XD, 7JX, 7ZG, 9ASF, 9EE, 9OE, 9YY, 9JN, 9ABX, 9AEG, (9WU), (9LR), 9SC, 9AIG, (9YW), 9AEY, 9YI, 9LW, 9AFX, 9AEQ.

6TG, OJAI, CALIF.

5ZA, 6AAM, 6ACI, 6ACM, 6ACR, 6ADL, 6AFN, 6AH, 6AIL, 6AJ, 6AJH, 6AK, 6AM, 6BJ, 6CV, 6DK, 6EA, 6EB, 6EC, 6EN, 6ER, 6FI, 6GI, 6GT, 6HC, 6HH, 6IG, 6IT, 6IU, 6IV, 6JI, 6JJ, 6JN, 6JR, 6KM, 6KP, 6KX, 6KZ, 6LB, 6LM, 6MC, 6MK, 6MZ, 6OC, 6OW, 6OY, 6PJ, 6PQ, 6RN, 6SK, 6TC, 6TE, 6TF, 6TV, 6VL, (6VZ), 6WN, 6XZ, 6ZA, 6ZH, 6ZN, 6ZR, 7IN.

6AE, STANFORD UNIVERSITY, CALIF.

(5XD), (5ZA), 6ABP, (6ADL), 6ADX, 6AJH, (6DA), (6EA), 6EB, (6ED), 6EK, (6EN), (6ER), 6GH, 6GP, 6GW, 6HH, 6HY, 6ID, 6IF, 6IS, 6IU, 6IV, 6IZ, (6JD), 6KA, (6KP), 6MX, 6NY, (6OL), 6PQ, (6PR), 6RE, 6RN, 6UF, 6VL, 6WN, 6WZ, 6XZ, 6ZB, 6ZH, (6ZM), (6ZN), 7AD, (7BC), 7BH, (7BJ), (7BK), 7BP, 7BQ, 7BR, 7CE, (7CC), 7CW, 7DH, 7EX, 7GI, 7GQ, (7IN), 7JR, 7KB, 7KK, 7KU, 7LU, 7OJ, (7YA), 7YS, 7ZA, 7ZB, 7ZH, 7ZI, (7ZJ), 7ZK, 8GW, 9AVS, 9YW.

6KL, OAKLAND, CAL.

5ZA, (6AT), (6EB), 6ED, (6EN), (6ER), 6DP, (6DK), (6GF), 6HH, (6HY), 6IG, (6JD), 6JI, (6JM, (6KA), (6KP), 6OT, (6PR), 6PQ, 6RN, 6SK, 6ZA, (7BK), (7BO), 7BP, 7ED, (7CC), 7FK, (7DA), (7O), 7YA, (7ZI), (7ZJ), 9LR.

6CU, LOS ANGELES, CALIF.—Janary.

5XD, 5ZA, 6AAK, 6AAT, 6AAW, 6ACD, 6ADA, 6AE, 6AFU, 6AFY, 6AH, 6AID, 6AK, 6AN, 6BJ, 6BQ, 6CO, 6CV, 6DK, 6DP, 6EJ, 6EX, 6FH, 6FI, 6GF, 6IB, 6IG, 6IY C.W., 6JI, 6JJ, 6JN, 6JR, 6JT, 6KM, 6OH, 6OT, 6OW, 6PG, 6PR, 6QD, 6QR, 6QY, 6TC, 6WN, 6XZ, 6ZA, 6ZB, 6ZB, 6ZE, 6ZK, 6ZM, 7DA, 7GB, 7IM, 7YA, 7YA, 7ZA, 7ZB, 7ZJ.

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ASA S. KELLER, CASHMERE, WASH.
Jan. 8-Feb. 18.

6AA, 6AC, 6AD, 6AE, 6AF, 6AG, 6AH, 6AK, 6AN, 6AS, 6AW, 6BJ, 6CV, 6DJ, 6DP, 6EJ, 6EN, 6FC, 6FH, 6FI, 6FL, 6GF, 6GK, 6GY, 6HH, 6IC, 6JA, 6JZ, 6KL, 6LH, 6LI, 6LJ, 6LK, 6LL, 6LN, 6LR, 6OC, 6OH, 6G, 6PQ, 6PR, 6RK, 6RR, 6ZA, 6ZR, 6AAR, 6ACD, 6ACQ, 6AIW, 7AD, 7BC, 7BH, 7BJ, 7BK, 7BP, 7BQ, 7CC, 7CH, 7CK, 7CO, 7CW, 7DA, 7DC, 7DI, 7DJ, 7DO, 7DP, 7DQ, 7DS, 7ED, 7EK, 7EP, 7FB, 7FL, 7GJ, 7GK, 7GQ, 7GY, 7IC, 7IN, 7JR, 7JX, 7JZ, 7LR, 7MD, 7OH, 7QQ, 7RR, 7WC, 7YA, 7ZB, 7ZI, 7ZJ, 7ZK, CL1, CL2.

7AD, SEATTLE, WASH.,—Jan. 1.-Feb. 15.

5YH, 5ZA, 5ZH, 6AAJ, 6AAK, 6AAT, 6ABP, 6ACA, 6ACM, 6AE, 6AEW, 6AFN, 6AGF, 6AH, 6AIL, 6AK, 6AN, 6BB, 6BJ, 6BQ, 6CC, 6CO, 6CV, 6DH, 6DK, 6DP, 6DY, 6EA, 6EJ, 6EN, 6ER, 6EX, 6FE, 6FH, 6FI, 6FJ, 6GI, 6GR, 6GY, 6HC, 6HH, 6HP, 6HY, 6IF, 6IU, 6IY, 6JD, 6JI, 6JJ, 6JQ, 6KM, 6KP, 6OC, 6OH, 6OT, 6OW, 6PK, 6PM, 6PO 6PQ, 6PR, 6QM, 6QR, 6QY, 6RE, 6SK, 6TC, 6UM, 6VS, 6WZ, 6ZA, 6ZE, 6ZH, 6ZK, 6ZM, 6ZN, 6ZO, 6ZR, 7BH, 7BP, 7BQ, 7BR, 7CC, 7CW, 7DA, 7DH, 7DM, 7ED, 7EX, 7FB, 7FI, 7FL, 7FQ, 7GQ, 7HH, 7HS, 7IN, 7JP, 7JR, 7JX, 7YA, 7YG, 7YS, 7ZG, 7ZI, 7ZJ, 7ZK.

7KX, CASPER, Wyo.,—Jan. 20-Feb. 28.

5BM, 5BR, 5DD, 5HL, 5HV, 5IF, 5JH, 5JS, 5LD, 5LS, 5MF, 5ZA, 5ZC, 6FI, 6FL, 6IG, 6JT, 6TB, 6QR, 6ZA, 6ZM, 6ZH, 6ZR, 7CC, 7EX, 7FL, 7HS, 7MO, 7ZG, 8KI C.W., 9AP, 9BW, 9BY, 9DC, 9DB, 9DO, 9DV, 9ET, 9EQ, 9EY, 9FL, 9FU, 9GS, 9GN, 9HI, 9HM, 9IF, 9JL, 9JN, 9LA, 9LB, 9LC, 9LR, 9LW, 9MC, 9MB, 9NQ, 9OE, 9OB, 9OO C.W., 9PL, 9PN, 9PS, 9RU, 9SZ, 9TI, 9QO, 9UT, 9UU, 9UQ, 9VC, 9WI, 9WU, 9XI C.W., 9XL, 9XT, 9XW, 9YA, 9YI, 9YO, 9YW, 9ZB, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZZ, 9AAW, 9ABX, 9ACF, 9AEG, 9AEJ, 9AEQ, 9AEY, 9AFX, 9AFO, 9AGN, 9AHS, 9AID, 9AIF, 9AIG, 9AIZ, 9AJI, 9AJS, 9AKC, 9ALO, 9AMH, 9AMX, 9AND, 9AOJ, 9AON, 9AOO, 9ARJ, 9ARQ, 9ARX, 9ATO, 9AUU, 9AVC, 9AWB, 9AWG, 9AWK, 9AXR, 9AXV, 9AXU, 9AYW, 9DCG, 9DBT.

7ZG, BEARCREEK, MONTANA—Jan. and Feb.

1IRJ, 2RK, 3DM, 5BI, 5IF, 5EF, 5XB, 5XD, 5YE, (5ZA), 5ZJ, 6AE, 6AF, 6AH, 6AK, 6ACD, 6AFD, 9AGF, 6AEZ, 6AIW, 6AMF, 6BJ, (6BQ), 6CD, 6CO, 6DP, 6EA, 6ED, 6EJ, 6FE, 6FI, 6IG, 6KE, 6MK, 6JD, (6JT), (6PE), 6QR, 6RE, 6VS, (6WV C.W.) (6ZA), (6ZH), 6ZJ, 6ZK, (6ZM), 6ZN, 6ZO, 6ZR, 7AD, 7AF, 7BC, 7BM, 7BL, 7BP, (7BQ), (7CC), 7CW, (7DH), 7DS, (7EX), 7ED, 7FI, 7FL, 7GA, (7GK), 7GO, (7HS), 7IN, 7IY, 7JD, 7JR, 7JX, 7KL, (7LU), 7ME, 7MP, 7XB, (7YA), 7YG, 7YS, 7ZB, (7ZH), (7ZI C.W.,) (7ZJ), 7ZK, 8ZC, 8ZR, 9AAC, 9AAW, 9ABT, (9ABX), 9ACB, 9ACF, 9ACN, 9AEG, (9AEQ), (9AEY), 9AFO, 9AFX, (9AGN), 9AGR, 9AHF, 9AIO, 9AIF, 9AIG, 9AJS, 9AKX, 9ALU, 9ALO, 9AMB, 9AMH, 9AMT, 9AMU, 9ANN, 9AON, 9ARJ, 9ARQ, 9ASF, 9ASJ, 9ATD, 9ATO, 9BJ, 9BW, 9DBT, 9DC, 9DCG, 9DM, 9DO, 9DU, 9DY, 9EE, (9EL), 9EQ, 9ET, 9FZ, 9GN, 9HC, (9HI), 9HM, 9HT, 9IF, 9JA, 9JB, (9JN), 9JI, 9KN, 9LA, 9LN, (9LR), 9LW, 9NQ, (9OE), (9OT), 9PI, 9PL, 9QO, 9RG, 9RV, 9SC, 9SZ, (9TI), 9UT, 9UQ, 9WI, (9WU spk. & C.W.,) 9XI, 9XT, (9XM spk. & C.W.), 9YA, (9YG), 9YI, 9YM, 9YO, 9YP, (9YW), 9YY, 9ZB, (9ZC), 9ZJ, 9ZL, (9ZN), 9ZQ, 9ZT C.W., 9ZU, 9ZY

8APS, HOLLAND, MICH.

1RK, 1XD, 1XF, 5MF, 8AG, 8AR, 8AY, (8CP), 8DG, 8HG, 8HL, 8IE, 8JE, 8JR, (8JZ), 8KZ, 8LR, 8LU, 8ML, 8NZ, 8OL, 8QJ, 8RE, 8RW, 8SP, 8WO, 8WY, 8WZ, 9AC, 9AW, 9AY, 9BY, 9DD, 9DN, 9DV, 9EO, 9EQ, 9FN, 9GP, 9IC, 9GD, 9JE, 9JL, 9JN, 9KJ, 9LA, 9LN, 9LQ, 9LR, 9LW, 9MC, 9MN, 9NQ, 9OO, 9PN, 9QO, 9SP, 9ST, 9TB, 9TW, 9UK, 9UT, 9VC, 9ZD, 9ZH, 9ZL, 9ZQ, 9ACL, 9ACN, 9AON.

8HJ, ELMIRA, N. Y.

1CY, 1MX, 1UN, 1EAT, 1EAV, 1GAW, 1LAX, (1VAA), 1JBG, 1XJ, (1YB), (2DA), 2HJ, (2JU), 2MJ, 2UA, 2UC, 2SH,, 2TF, 2VA, 2ABM, 2AST, 2AWL, 2ZC, (3BP), (3HG), 3NB, 3OU, 3SM very QSA, 3XF, (8AJ), 8AY, 8BC, 8BO, 8CF, 8CG, (8FN), (8FT), (8ID), 8JQ, 8KM, (8MH), (8RQ), (8SH), 8UY, 8VU, (8WV), (8ABG), (8ADH), 8AFO, 8AJT, 8AMM, (8AMZ), 8AOT, 8AVC, (8AVD), (8XE), (8XU), 8ZL, 8ZP, 9UU, 9AAF, 9AAW, 9AKH, 9AWZ, 9AYE, 9ZN, 9ZQ, (NSF).

8JQ, WASHINGTON, PA.

1AE, 1AS, 1AW, 1BM, 1CM, (1CY), 1CZ, 1JQ, 1WR), 1XB, 1XD, (1XT), 1XX, 1YB, 1ARJ, 1BBL, 1GAI, 1HAA, 1RAD, (1RAY), 2BK, (2DA), (2DI), 2DR, (2EL), (2FG), 2GR, 2HK, 2JJ, 2JU, 2OA, 2OO, 2RK, 2RL, 2SR, 2SZ, (2TF), 2UK, 2VA, 2XJ, 2XX, 2ZC, 2ZL, 2ZM, 2ACT, (2ALK), 2ALY, 2ARA, 2BGR, 3BP, 3BZ, (3CC), (3DH), (3EH), 3EN, 3FG, 3GO, (3HJ), 3HG, (3NB), 3PS, (3PU), (3QW), 3VV, (3XF), 3YG, 3IW, 3WK, 3ACS, (3AHK.), (4AG), 4CK, 4EY, 4XB, 4XC, 4YA, (4YB), 5DA, 5XA, 8AD, 8AN, (8BC), 8FC, 8GI, (8HY), 8JJ, 8JS, 8KP, (8OW), 8PU, 8QQ, 8QJ, 8RG, 8RI, (8TN), 8WO, 8WY, 8XE, 8ZL, 8ZR, 8AGB, (8AGK), 8AJB, 8AMQ, 8AMZ, 8APB, 9DB, 9EQ, (9FS), 9FZ, 9GN, 9GP, 9GX, 9HI, 9HJ, 9HN, (9HR), 9JN, 9JQ, 9JV, (9LQ), 9LR, (9MC), 9NQ, 9SJ, 9SQ, 9UF, 9UK, 9VC, 9WC, 9WE, 9YB, 9YI, 9ZB, 9ZJ, 9ZL, 9ZQ, (9ACJ), (9AON), 9ASL, 9AIX, NSF.

8ZA, NEW PHILADELPHIA, OHIO.

1AE, (1AW), 1BBL, 1CK, (1CY), 1EAM, 1GBC, 1GBT, 1HAA, 1IRZ, 1JBT, 1OE, (1RAY), (1RZ), 1RA, 1TS, 1VA, 2ALK, (2AR), (2FG), 2JU, 2BB, 2BG, 2BGR, 2CS, 2DA, 2EL, 2KY, 2RK, (2SZ), 2ZC, 2ZL, (2ZM), (3ABC), (3AHK), 3ARN, 3ACF, 3BP, 3BH, (3BZ), 3DH, (3EH), 3EI, 3FG, (3GO), 3GW, (3HG), 3HX, 3LI, 3PS, 3PU, 3QW, 3SM, 3YG, (3YV), 4AG, 4BO, 4BY, 4DM, 4EY, 4XB, (4XC), 4YA, 4YB, 4ZA, 5DA, 5DK, 5YE, 5YH, 5XA, 5ZP, (8AK), (8ACF), (8AKJ), (8AGB), 8AGZ, (8AMQ), 8ANJ, 8ALM, 8BC, 8BO, 8BP, 8DR, (8DJ), (8EV), 8GB, 8GI, (8GW), 8HG, (8HP), 8HS, (8IK), 8JQ, (8JJ), 8KK, 8KP, 8LF, 8MZ, 8NZ, 8PN, 8PU, 8QQ, (8RQ), (8SH), 8WP, 8XA, (8XE), 8XH, 8XU, 8YV, 8ZB, (8ZD), 8ZE, 8ZF, (8ZL), (8ZR), (8ZV), 8ZW, (8ZX), (8ZY), (9AAF), 9ABL, 9AEG, 9AGV, 9AGW, 9AHO, 9AON, 9AWZ, 9BP, 9BW, 9BY, (9CP), (9DV), (9DBT), (9DFK), 9EL, (9EQ), 9ET, (9FG), (9FN), (9FS), (9GC), (9HM), (9HN), (9HR), (9JT), 9HT, 9KL, 9KN, 9KR, 9KV, 9LA, 9LC, 9JN, 9LR, (9MC), 9MS, 9NQ, 9OE, 9PV, 9RY, 9UK, (9UU), 9XI, (9XW), 9XM, 9YB, 9ZB, (9ZL), (9ZN), (9ZQ).

8ZY, DEFIANCE, OHIO.

1AW, 1OE, 1RQ, 1TS, 1HAA, 1RAY, (2BK), (2DA), 2DR, 2EL, 2JU, 2OM, 2OA, (2RK), 2RL, 2TF, (2UE), 2SZ, 2TS, (2ALK), (2ZM), 2ZL, C.W.; 2XQ fone 60 ft., 3BP, (3BZ), 3CC, (3DH), (3EN), (3GO), (3HJ), 3HX, 3OA, 3PU, 3QF, 3QW, (3NB), 3KKF, 3AAE C.W., 3ACS, (3AHK), (3ALN), 4XC, 4YA, 4YB, 5BM, 5DA, (5EW), 5JD, 5JE, 5MF, 5XA, (5YH), (5ZX,, 6ER, 7CC, 8AY, 8ADE. 8ADQ, (8ALG), (8ARS), 8AFS, 8AFQ, 8AAU, 8AEB. (8ACF) 8AGK, 8AGO, 8AL, 8AD, 8AG, 8BC. 8CH, 8DR, 8EC, 8EV, 8FI, 8FT, 8FC, 8GW, (8HA), 8HG, 8HP, 8ID, (8IK), 8IV, 8JE, (8JJ), 8KM, 8KK, 8LH, (8LV), (8LQ), 8MZ, 8NZ, 8JU, 8QJ, 8RQ, 8SP, 8PU, 8TT, 8UR. 8VQ, 8WY, (8XE), 8XH, 8XI, (8XK), (8XU), (8ZA), (8ZD), 8ZE. 8ZG, (8ZR), 8ZT, 8ZH. 8ZW, (9AAW), 9AAF. 9AAC, (9AON), (9AWV), 9AGY, 9AEQ. 9AXU, 9AJI, 9AKC, (9AEG), 9AWX, (9ACN), 9ACL. 9AK, 9AWZ, 9ABL, 9ATN, 9ARG, 9AEY. 9AGY, 9AUO, (9DBT), 9DBQ, 9DFB, 9DFK, 9DFC. 9DCG, 9EAQ. (9BP), 9BW. 9BY C.W., 9CQ, 9CA. 9CS, 9CP, 9DC. (9DV), (9EE), (9EL), 9EQ, 9ET. (9FS), 9FG, 9FN. 9FU, 9GP, 9GY, 9GN, 9HN, (9HI). (9HR), (9HM), 9IF, 9JA, (9JN), 9JT. 9JL, 9KB, 9JQ, 9KO, 9KN, 9KL, (9KQ), 9KZ. (9LA), (9LR), 9LW, 9MC. 9MH, 9HS, (9NQ). (9OE). 9OX. 9OR. 9ON. 9QR, 9QO, 9SQ, (9TI). 9TV, 9UU. 9UT. 9VC, 9WT. 9WZ, (9WU), 9XM. (9XI), 9XW, 9YA, (9YM), 9YR, 9YO, 9YV, 9YZ. (9YW), (9YI), (9ZB), (9ZN), (9ZL), (9ZC), (9ZJ), (9ZQ).

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8ACM, (NOW 8AYM), JAMESTOWN, N. Y.
1BBL, 1CK, 1EAV, 1GBC, 1HAA, 1MAD, 1RAY, 1RZ, 1TS, 1XF, 1XT, 1XX, 2AER, 2AID, 2ALK, 2AWL C.W. & fone, 2BG, 2BGR, 2BK, 2BM, 2DA, 2DY, 2EL, 2FG, 2JU, 2ND, 2NN, 2OA, 2OB, 2QR fone, 2SS, (2SZ), 2VA, 2XQ, 2ZM, 2AR, 3AAG, 3ACS, 3AEP, 3BG, 3BZ, 3BP, Can., 3CG, 3DH, 3EH, Can., 3HG, 3HJ, 3HX, 3IW, 3NB, 3PS, 3PU, 3TK, 3VV, 4AG, 5DA, 5YH, 8AD, 8ABG, 8AEE, 8AGK, 8AIS, 8AJL, 8AJT, 8AMB, 8AMM, 8AMQ, 8AMZ, 8ALG, 8AOT, 8AQL, 8ARF, (8ARK), 8BP, 8CG, 8CP, 8CX, 8EF, 8FE, 8GA, 8GH, 8GI, 8HA, 8HJ, 8IF, 8IK, 8JJ, 8JQ, 8KK, 8KP, 8LB, 8LV, 8LX, 8MP, 8MZ, 8NN, 8NZ, 8OI, 8OJ, 8PN, (8PU), 8QJ, 8RW, 8SH, 8SP, 8TC, 8TN, 8TT, (8WY), 8WO, 8WV, 8XA, 8XE, 8XU, 8ZD, 8ZF, 8ZL, 8ZN, 8ZR, 8CH, 9AAF, 9AAG, 9AAG, 9AAW, 9ABL, 9ACN, 9AEG, 9AKM, 9BP, 9CP, 9DH, 9EQ, 9FG, 9FN, 9FS, 9GN, 9GO, 9HR, 9JA, 9JK, 9JN, 9KK, 9KL, 9LM, 9LR, 9LQ, 9MC, 9OR, 9OJ, 9RT, 9UU, 9ZB, 9ZN, 9ALS, 9DV, BCO, NSF, WL2, XB1, XF1.

9AAW, CHICAGO, ILL.
1AW, 1GM, 1OE, 1HAA, 1JBT, 2AL, 2BK, 2DR, 2EL, 2JJ, 2NE, (2RK), 2SZ, (2TF), 2UE, 2VA, 2XX fone, 2ZM, 2ALK, (3BP Canadian), (3CC), (3DH), 3EN, (3GO), (3HJ), (3NB), 3OB, 3PU, 3SG, 3YA, 3ZM, (3AHK), 3ALK, (4AG), 4XC, 5JE, 5XB, 5YE, (5YH), 5ZA, 8AB, 8AY, (8BC), 8BO, 8BP, 8BU, 8DR, 8DV, 8FI, (8FK), 8FT, 8GI, 8GX, 8HG, (8IK), 8IV, (8JE), 8JJ, 8JP, 8JQ, 8KK, (8KM), 8KP, 8LQ, 8MF, 8OJ, 8PN, 8QJ, 8RE, (8RQ), (8TN), 8TK, 8UF, (8VJ), (8WY), (8XE), 8XK, 8XU, 8ZA, (8ZD), (8ZE), (8ZL), 8ZR, 8ZW, (8ZY), 8ADE, (8AFS), 8AGK, 8AGO, 8AIB, 8AIO, (8ALG), 8ARW, (9DU), 9EE, 9EL, (9EQ), 9FS, 9GN, (9GP), 9HM, (9JN, (9JQ,) 9KE, 9LA, 9LQ, (9LR), 9MC, 9MS, 9NQ, 9OE, 9UH, 9UK, (9VZ), 9WE, 9WT, 9XB, 9XI, 9XM, 9XW, 9YM, 9YY, 9ZB, 9ZJ, (9ZL), 9AAC, 9AAF, 9AEG, 9AJN, 9AON, 9AWZ, 9DDA, NSF, WL2, XB1, XF1, XK1.

9OE, WICHITA, KANS.
2RK, 4BQ, 4XC, 5AF, 5AJ, 5BM, 5BO 5BR, 5CG, 5CI, 5DO, (5EA), (5EJ), (5ER), (5EW), (5FL), (5HV), (5IF), 5IS, (5JD), (5JE), 5JR, (5LR), 5LS, 5MF, (5ML), 5XB, (5YH), (5ZA), (5ZC), 5ZD, 5ZJ, (5ZS), (5ZT), (5ZU), (5ZV), (6ZW), 5ZX, 6GE, (6IG), 6KP, (6WV), 7DH, (7EX), 7LU, 7ZG, 8AE, 8BP, 8CF, 8DC, 8DZ, 8FK, (8FT), 8HG, 8IG, 8IK, 8JJ, (8KP), (8ML), 8NI, (8QJ), (8TN), (8UY), 8VJ, 8XS, (8ZL), 8ZR, 8ZV, 8ZW, 8ZX, (8ZY), 8AFS, 8AIB, 8AKV, 8AKS, (9BQ), 9BY, 9CA, 9DC, 9DD, 9DQ, 9DU, (9DV), (9EE), (9ET), (9EW), 9FF, 9FJ, (9FS), 9FU, 9FT, 9GC, (9GN), (9GP), 9HM, (9HN), (9HT), 9HY, 9IE, (9IF), 9IY, (9JA), (9JN), (9JQ), 9JT, 9KL, 9KN, 9KO, (9LC), 9LF, (9LQ), (9LW), 9LZ, (9MC), 9MH, 9MS, 9NQ, 9OA, 9OB, 9OO, 9OX, (9PV), 9QJ, 9SP, 9SQ, (9TF), 9TH, (9TI), 9TW, (9UF), (9UH), (9UT), (9VC), (9WI), (9WU), (9XI), (9XM), 9XW, (9YA), (9YG), 9YI, (9YW), (9ZB), (9ZC), 9ZJ, (9ZL), 9ZN, (9ZQ), 9ZZ, 9AAB, 9AAC, 9AAG, 9AAW, 9ABX, 9ACG, (9ACL), (9ACN), (9AEQ), 9AFO, (9AFX), (9AGY), (9AIF), 9AJI, (9AJS), (9AKC), 9AKR, (9ALK), 9ALS, 9ALLY, (9AMB), 9AMI, (9AMK), 9AMS, 9AOJ, (9AON), 9AOU, (9AOX), (9ARG), 9ASF, 9ASL, 9ATO, 9ATN, (9AVC), (9AWG), (9AWX), 9AYE, 9AYW, (9AXU), (9DBT), 9DCG, (9DCO), 9DFD.

9UT, SIOUX FALLS, S. D.
5BM, (5BO), (5EJ), 5ER, (5EW), (5HL), 5HV, 5IE, (5IF), (5IS), 5JD, 5JM, 5LA, 5LR, 5LO, 5LS, 5MF, 5XB C.W., 5YH, 5YS, 5ZA 5ZG, 5ZS, 5ZU, 6IG, (7LU), 8ADY, 8AG, 8ALS, 8AXC C.W., 8AY, 8DZ, 8FT, 8GH, 8HZ, 8JJ 8KI C.W., 8KP, 8LR, 8LQ, 8ML, 8OZ, 8PC, (8QJ), 8RO, 8TK, 8VJ, 8XK C.W., 8XR, 8YG C.W., 8ZA, 8ZJ, 8ZL, 8ZQ, 8ZR, 8ZW, 9AAF, 9AAG, 9AAR, 9AAW, 9ABX, 9ACD, 9ACL, (9ACN), 9AEG, 9AEQ, (9AEY), 9AFK, (9AFO), (9AFQ), 9AFX, 9AGN, 9AGY, 9AHF, 9AHS, 9AHZ, 9AIL, 9AIZ, 9AJI, 9AJN, 9AJS, (9AKC), 9ALY, (9AMB), 9AMH, 9AMT, 9AMX, 9AOJ, (9AON), 9AP, 9ARJ, 9ASL, (9ATL), (9ATO), (9AUO), 9AUX, 9AW, (9AWG), 9AWX, 9AWZ, 9AXJ, 9AXU, 9AXU, (9AYE), (9AYW), 9BB, 9BM, 9BP, 9BT, 9BW, 9BY, 9CA, (9CP), 9CS, 9CW, (9DAT), 9DB, (9DBT), 9DE, 9DFK, (9DFT), 9DV, 9EE, 9EL, 9EQ, (9ET), 9FG, 9FI, 9FN, 9FS, 9FZ, 9GC, 9GN, 9GP, 9GQ, 9GS, (9HI), 9HJ, 9HL, 9HT, 9HY, (9IF), 9JA, 9JK, 9JL, 9JN, 9JQ, 9JT, (9JV), 9KA, 9KG, 9KK, 9KL, 9KN, 9KO, 9KP, 9KV, 9LA, 9LB, 9LF, 9LN, 9LQ, (9LR), (PLW), 9LY C.W., 9LZ, 9MC, 9MH, (9MS), (9NQ), (9OE), 9OR, (9PI), 9PN, (9PS), 9PV, (9QO, 9RG, 9RY, 9SQ, (9SZ), (9TI), 9TO, 9TW, 9UF, (9UG), 9UK, 9UP, (9UU), 9VR, (9WI), 9WT, 9WU, 9XI, 9XM, 9YA, 9YI, 9YM C.W., 9YY, (9ZB), 9ZC, 9ZG, 9ZJ, (9ZL), 9ZN, 9ZQ, 9ZV, 9ZY, NSF C.W. & fone.

9DV, NEENAH, WISCONSIN.
1AW, 2DR, 2EL, (2RK), 2SZ, 2XQ, 3DH, 3EN, 3HG, 3HJ, 3NC, 3AHK, 4XC, 5BM, 5BR, 5BZ, 5HL, 5HV, 5LA, 5MF, 5JE, 5YE, 5YH, 5ZA, 5ZC, 5ZD, 8AB, 8AD, 8AL, 8AR, 8BO, 8BP, 8CF, 8DC, 8OP, 8DR, 8DV, 8EB, 8EK, 8FI, 8FT, 8GB, (8GI), 8GO, 8GW, 8HG, (8HJ), 8HP, 8ID, 8IL, 8IK, 8JE, 8KK, 8KM, (8KP), 8KZ, 8LD, 8LF, (8LQ), 8LR, 8MF, 8ML, 8OC, 8OI, 8OZ, 8QJ, 8RU, 8SK, 8TN, 8TT, 8VJ, 8VQ, 8WY, 8ADY, 8AFS, 8AKJ, 8AKV, 8AMJ, 8ALG, 8AWK, 8FAA, 8XA, (8XE), 8XS, (8ZA), 8ZD, (8ZL), 8ZR, 8ZW, 8ZY, 9AT, 9AU, 9BK, 9BP, 9BT, 9BW, 9DB, 9EE, (9EL), 9EO, 9FL, 9FS, 9FT, 9FU, 9GN, 9GO, 9GQ, 9HI, 9HM, 9HN, 9HT, 9IF, 9JA, (9JN), (9JQ), 9KL, (9KO), 9KR, 9KS, 9KW, (9LA), 9LB, 9LC, 9LF, 9LQ, (9LR), 9LW, 9MC, 9NQ, (9OE), 9OG, 9OJ, 9PC, 9PN, 9PS, 9PV, 9QO, 9QY, 9RG, 9RP, 9RY, 9SO, 9SP, 9SQ, 9SZ, (9TI), 9UG, (9UK), 9UT, 9VA, (9VC), 9WE, (9WI), 9WO, 9WT, (9WU), 9WW, 9AAC, 9ABT, 9ABX, 9ACD, 9ACL, (9AEG), 9AEQ, 9AEY, 9AFK, 9AFO, 9AGN, 9AHS, 9AHZ, 9AIN, 9AJN, 9AJS, 9AKM, 8AMH, 9AOG, 9AOJ, (9AON), 9ARJ, 9ARK, 9ASF, 9ASJ, 9ATO, 9AXU, 9XI, 9XW, 9YA, 9YB, 9YG, 9YI, 9YM, 9YO, 9YW, 9YY, (9ZB), (9ZC), (9ZQ), 9ZZ, NSF.

9XI, MINNEAPOLIS, MINN.
WA1, XF1 C.W., 2OA, 2PL, 2RK, 2XX C.W., 2ZD C.W., 2ZI, 2ZL C.W., 3BP, 3CW, (3DH), 3MI, 3XF, 4AG, 4BI, 4CS, 4XC, 5BY, 5EJ, 5HV, 5JD, 5MF, (6WV C.W.), 7EX, 7YA, 7ZG, 8AB, 8AD, 8AL, 8BP, 8CW, 8DZ, 8FT, (8IB C.W.), 8ID, (8IK C.W.), 8IV, 8JJ, 8KP, (8MF), 8MH, 8NZ, 8PI, 8PM, (8TN), (8TY), 8UK, 8UY, 8VJ, 8VS, (8XA), 8XK C.W., 8XP, 8XS, (8YG C.W. & fone), 8YR, 8YS, 8ZA, 8ZC, 8ZL spk. & fone, 8ZR, 8ZW, 8ZY, 8ZZ, (8ADY C.W.), 9AG, 9AJ, 9AY, 9AZ, 9BP, 9BR, 9BV, 9BW, (9BY C.W.), 9CA, 9CP, 9DB, 9DC, 9DJ, 9DV, (9EE), 9EK, (9EL), 9EQ 9ET, 9EW, 9FG, 9FS, 9FZ, 9GC, 9GN, 9GP, 9GV, 9HG, 9HI, 9HQ, 9HT, 9IY, 9JK, 9JN, 9JQ, 9KE, 9KI, 9KN, 9KR, 9KU, 9KV, 9LA, 9LB, 9LG, 9LL, 9LR, 9LU, 9LW, 9MC, (9MH), 9MS, 9NC, 9NO, 9OE, 9OK, 9PN, 9PS, 9PV, 9QO, 9QR, 9RG, 9RQ, 9SQ, 9SZ, 9UJ, 9UK, 9UT, 9UU, 9WH, 9WI, 9WT, (9WU), (9XM spk., C.W. & fone), 9XT, (9YA), 9YF, 9LG, 9YH, (9YI), (9YM spk. & C.W.), 9YN, 9YO, (9YW spk. & C.W.), 9YX 9YY, 9YZ 9ZA, 9ZB, (9ZC), 9ZJ, (9ZL), (9ZN spk. & C.W.), 9ZR, 9AAV, 9AAW, 9ABX, 9ACJ, 9AEQ 9AEY, 9AFK, 9AFX, 9AGN, 9AHS, 9AIN, 9AIR C.W., 9AJS, (9AON), 9ASF, 9AWX, 9AXU, 9AYE, (9DBT), 9DSE.

9DCG, PAPILLION, NEBRASKA.
1AW, 4AL, 4MI, 5QA, 5YO, 5YV, 5ZA, 5ZO, 7LU, (9AAX), 9ABX, (9ACS), 9AEG, (9AEQ), (9AFX), (9AHW), (9AIS), (9AJC), (AJS), (9ALK), (9ALO), 9AMA, (9AMB), (9APA), 9AQ, (9AQC), (9AQS), (ASO), (9ASW), (9ATC), (9AWK), 9AXU, (9AYS), 9BR, 9BQ, 9DBS, 9EL, 9EQ, 9ET, (9EW), (9GN), (9HT), 9LA, 9LQ, 9LR, 9LW, 9MC, 9MS, 9OE, 9QL, (9SC) 9SN, (9UQ), 9UU, (9VE), 9VR, 9XI, 9XM, (9XT), 9YD, 9YI, 9YN, (9YO), (9YP, both C.W. and spk.), (9YY), 9YT, 9ZN, 9ZC.

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February Station Reports

THIS is the new department of our QST announced on page 18 of the January issue. If you don't remember the article, read it again so you will appreciate the value of this section. We hope that it will be a guide to us as to just where we can work and how well, thereby enlarging upon the knowledge gained thru "Calls Heard" alone. This department should be an accurate table of who is loudest and who most consistent in every section of the country. The reports at present are confined to members of the Operating Department personnel.

The scheme is for each reporting station to list the best, second and third best stations from each district, both as regards consistency (steadiness, reliability) and as regards relative strength of signals. In the groups of three calls hereinafter, the first one is the best, the second next best, and the last one third best. Where no stations are listed from certain districts, none were heard.

1TS, Bristol, Conn.

1HAA—1YB—1RAY
2RK—2OM—2JU
3ABI (c.w.)—3DH—3VV
4XB (c.w.)—4YA—4EY
8XE—8ZV (c.w.)—8ZL
9ZL—9AAW—9ZJ
Can. 3BP—2AK—2CI

3NB, Vineland, N. J.

Steadiest	Loudest
1RAY—1OE	1HAA—1AW
2TF—2SZ—2VA	2SZ—2TF—2RK
3GO—VMI—3FG	VMI—3YV—3GO
4XC	4XC—4AG
8ZL—8ZY—8ZR	8ZW—8XE—8ZY
9ZN—9AAW—9ZL	9ZL—9AAW—9ZN

General Reception Report for District of Columbia. Compiled from Washington Radio Club stations by F. X. Baer, District Supt., 3XF.

Steadiest		Loudest
1AW—1HAA—1BBL		1HAA—1AW—1BBL
1XT—1XX	(C.W.)	1XT
2RK—2EL—2DA		2RK—2BK—2JU
2ZL	(C.W.)	2ZL
3GO—3DH—3NB		3DH—3GO—3EN
4XC—4YB—4AL		4XC—4YB—4AL
5DA—5YH—5XA		5DA—5ER—5YH
8ZR—8ZL—8RQ		8ZW—8SP—8ZR
9ZJ—9ZN—9LQ		9ZJ—9ZN—9UH

3CA, Roanoke, Va.

1RAY—1HAA—1LBR
2DA—2ZM—2BK
3DH—3AHK—3PU
4BK—4XC—4EK
5YH
8ARW—8BP—8ACF
9LQ—9MC—9FS

4XC, Atlanta, Ga.

Steadiest	Loudest
None	1AW—1HR—1JAB
2RK—2JU—2EL	2RK—2DA—2ZM
3GO—3DH—3HJ	3AHK—3GO—3BZ
4BY—4AN—4AG	4BY—4YB—4FD
5YE—5YH—5DA	5YE—5YH—5DA
None	8SP—8ZY—8ZW
8ZY—8ZW—8ID	9ZJ—9YI—9LR

4YA, Atanta, Ga.

Steadiest	Loudest
None	1AW
2RK—2EL—2JU	2RK—2EL—2DA
3GO—3VV—3EN	3VV—3GO—3HJ
None	4AG—4FD—4BK
5YH—5ER	5XA—5YH—5ZP
8ID—8KP—8ZE	8ID—8ZW—8SP
9LR—9ZJ—9MC	9ZJ—9LR—9FU

5ZP, New Orleans

Steadiest	Loudest
2RK	2RK
3EN—3Z—3GO	3EN—3DH—3BZ
4AG—4XC—4BY	4XC—4AG—4EK
5XA—5YH—5ZX	5YH—5ZX—5YE
8ZY—8ZL—8IK	8ZY—8IK—8ZL
9AEG—9EL—9LR	9XW—9AEG—9JN

5XA, Auburn, Ala.

Steadiest	Loudest
1AW—1XP	1AW—1XP
2RK—2ZL—2EL	2RK—2DN—2GO
3VV—3O—3EN	3GO—3EN—3XR
4BY—4AG—4AN	4BY—4YA—4AG
5ZP—5YH—5HL	5YH—5ZP—5MF
8ZL—8SP—8KP	8ZL—8KP—8RE
9MC—9LR—9VC	9LR—9FU—9KV

5ZU, Austin, Tex.

Steadiest	Loudest
5XB—5LR—5YK	5XB—5LR
6IG	6IG
9LR—9ZT—9AEG	9LR—9ZJ—9AEG

9DU, Dubuque, Iowa.

Steadiest	Loudest
1XD—1XF	1XD—1XF
2RK—2ZL—2BK	2RK—2BK—2SZ
3DH—3EN—3AHD	3DH—3EN—3AHZ
3BY Canadian	3BY Canadian
4XB—4YB—4AG	4YB—4XB—4XC
5YH—5ZA—5YE	5YH—5ZL—5ZA
6ER	6ER
7EX (not very reliable)	7EX
8ZW—8ZR—8YG	8ZL—8ZR—8XK
9XM—9OE—9ZL	9OE—9JN—9LR

9ZL, Manitowoc, Wisc.

Steadiest	Loudest
None	1NAQ—1TS
2SZ—2RK—2TF	2RK—2SZ—2XQ
3DH—3GO—3NB	3DH—3NB—3CC
4XC	4XC—4AG
5YH	5YH—5YE—5ZA
8ZI—8ZR—8ZY	8ZW—8ZR—8XK
9HM—9ZC—9DBT	9YI—9JN—9ZJ

9ZC, Baudette, Minn.

Steadiest	Loudest
5YB—5ZA—5ZZ	5HS
7EX—7ZG	7EX—7ZG
8ZR—8ZY—8XK	8ZR—8ZY—8BP
9YI—9YW—9AGN	9YI—9JN—9XI

9HT, Omaha, Neb.

Steadiest	Loudest
2RK—2SZ	2RK
5ZA—5YH—5HL	5YH—5ZA—5EJ
6OT—6JD—6IG	6JD—6IG—6OT
7EX—7CC	7EX—7CC
8IK—8AKV—8ZL	8IK—8OJ—8ZL
9AKV—9AON—9UU	9LR—9AON—9ARG

9YB, Purdue University, Lafayette, Ind.

Most Consistent	Loudest
None	1AW—1XF
None	2RK—2ZM
3DH—3EN—3GO	3DH—3EN—3YV
4XC—4AU	4XC—4AU
5DA—5YH—5YE	5DA—5YE—5YH
8ZR—8ZA—8XE	8ZR—8ZL—8ZA

(Concluded on Page 60.)

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Radio Communications by the Amateurs

The Publishers of QST assume no responsibility for statements made herein by correspondents.

DISCUSSION OF M. B. WEST'S "WHYS AND WHEREFORES."

304 Columbus Ave.,
New York City.

Editor, QST—

I have read Mr. West's interesting article in the February QST concerning some important factors relative to spark transmitters. Since Mr. West invites discussion on this article, I take the liberty of pointing out some possible answers.

Probably one of the most important factors concerning the balance of spark transmitter oscillating circuits is the wattless component. But before taking up this discussion it may be well to review the behavior of a parallel resonance circuit. Fig. 1 represents an inductance and capacity connected in parallel and supplied by an alternating current source. The reactance due to inductance is equal to $2\pi fL$ while reactance due to capacity is equal to

$$\frac{1}{2\pi fC}$$

For the purpose of illustration let us neglect the resistance or other losses which would be in phase with the impressed E M F. It will be seen that if $2\pi fL$ minus

$$\frac{1}{2\pi fC}$$

equals zero there will be no phase displacement between the impressed voltage and current. In such an arrangement it may be shown that the local current value between the inductance and the capacity may be greater than the current value supplied by the external source. However, these currents are 90 degrees out of the phase with the impressed E M F and do no good insofar as the transmission of energy is concerned.

Fig. 2 represents a vector diagram showing a condition of the currents when the inductive reactance is equal to the capacity reactance.

Fig. 3 represents a vector diagram showing a condition of the currents when the capacity reactance is greater than the inductance reactance. It will be seen that the diagonal vector is the resultant component of the three quantities, inductance, capacity and resistance.

By inspection it may be seen that for most economical operation, that is to obtain the condition of least phase distortion, the vectors should result in—the one due to capacity being cancelled by the one due to inductance. When such a condition is brought about the impressed voltage and current may be multiplied directly at any instant to obtain the true energy in the circuit.

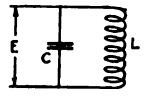
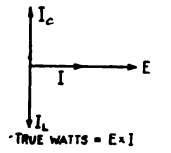


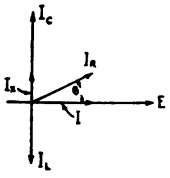
FIG. 1

FIG. 2



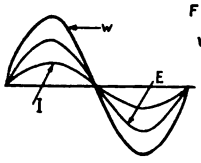
I_c = LEADING CURRENT DUE TO CAPACITY
I_L = LAGGING CURRENT DUE TO INDUCTANCE
I = RESULTANT IN-PHASE CURRENT DUE TO IMPRESSED EMF.
E = IMPRESSED EMF

FIG 3



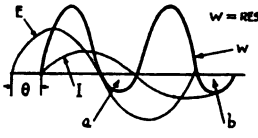
I_c = LEADING CURRENT DUE TO CAPACITY
I_L = LAGGING CURRENT DUE TO INDUCTANCE
I_R = LEADING EXCESS - DIF. BTN I_c AND I_L
I = COMPONENT OF IN-PHASE CURRENT DUE TO RESISTANCE, LOSSES, ETC
I_R = RESULTANT CURRENT
TRUE WATTS = $E \times I_R \cos\theta$

FIG. 4



W = RESULTANT TRUE POWER.

FIG 5



W = RESULTANT TRUE POWER

From the above it follows that an oscillating circuit should be so proportioned that the capacity reactance is neutralized by the inductive reactance, so that the impressed voltage and current may behave as though they were flowing in a circuit of pure resistance.

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Fig. 4 represents a set of power curves showing voltage and current in phase. Note the absence of negative power loops.

Fig. 5 represents the same set of curves showing an excessive inductance reactance causing the current to be distorted to a lagging position with respect to the impressed E M F. It will be seen that the small loops *a* and *b* of the heavy curve are the product of a negative current and positive voltage or vice versa giving a negative power component. This negative power component is known as the wattless component. It does no work in the circuit except to heat it and is returned to the supply source.

The important thing then is to proportion oscillating circuits so as to have

$$2\pi f L = \frac{1}{2\pi f C}, \text{ so that}$$

$$I = \frac{E}{\sqrt{R^2+\left(2\pi f L-\frac{1}{2\pi f C}\right)^2}}, \text{ or}$$

$$I = \frac{E}{R}, \text{ and } W = E I.$$

thereby eliminating these negative power or wattless component loops and secondly, so that the resulting in-phase voltage and current may do their best work and attain their highest values together. The resistance in the circuit including that of the spark gap should be reduced to a minimum.

I assume that the readers are familiar with the derivation of the formulae concerned in this discussion and also with the fundamental principles of alternating currents; therefore, I will not take the space to derive them. However, should there be any readers desiring the derivation of the formulae together with a physical explanation of the fundamental theory of alternating currents, I would be pleased to submit them for publication in a later issue. I also would be pleased to outline a possible method for improvement.

Respectfully,
Frederick Winkler, Jr.

Pacific Radio Supplies Company,
San Francisco.

Editor, QST—

Mr. McNamee and I have been very much concerned over the article by Mr. West, appearing on Page 21 of the Feb. issue of QST, because it is absolutely incorrect in many instances.

1. Mr. West in his opening paragraphs is trying to cloud, in an air of mystery, matters which should not be abstruse to radio people.

2. So far as the optimum wave length of a transmitter is concerned, which he mentions in the first paragraph, it should be remembered that the radiated energy is equal to the radiation resistance times the square of the antenna current. The radiation resistance of an antenna is, as has been shown many times in the papers of Austin and others, a hyperbola. The ground, or Joulean, resistance is a straight line function, so that the optimum wave length of a transmitter for maximum radiated energy is that wave length which will give the maximum antenna current consistent with the maximum radiation resistance. This point is more fully covered in my book, "Elements of Radiotelegraphy".

3. On page 22, Mr. West makes the following statement: "If we should connect a condenser and coil together in the same circuit and properly proportion the capacity of the condenser to the inductance of the coil we could exactly balance one against the other so that the tendency of the current to lead in the case of the condenser alone would be neutralized by the tendency to lag in case of the coil alone, and the result would be that we would transmit our power thru such a circuit with losses occasioned only by the resistance of the conductors and dielectric", and goes on to say that while "we have both inductance and capacity, it is seldom likely that they are so balanced as to produce ideal conditions. In fact, it seems that no attempt at all is made to balance them." I doubt if in all my radio reading I have ever seen a statement so contrary to fact as this. So far as *free oscillations are concerned, such as those obtained in a gap circuit, or in an antenna circuit shocked by impulse excitation, the very frequency of the circuit is that which automatically—we might say—balances or neutralizes the inductive and capacitive reactances. In the case of *forced oscillations, such as those impinged upon a receiving antenna circuit and which have the frequency of the exciting e.m.f., in the very act of tuning this circuit to resonance with the incoming frequency, we are doing exactly what Mr. West dictates—that is to say, we are balancing the inductive and capacitive reactances of the circuit. The only way in which we can have a low power factor in a radio frequency circuit is by detuning it from the impressed radio frequency, and in such a case, the current will fall off from its resonance value, rather than rise to the "amazing values" mentioned by Mr. West.

4. The definition of resonance, as used in radio parlance, is exactly the same as that used in alternating current practice, and if Mr. West does not know that in tuning a circuit to resonance, he is neutralizing the inductive and capacitive react-

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ances so as to produce unity power factor with the Joulean resistance of the circuit as the only impeding factor, it is about time that he learn this fundamental fact.

5. Figures 3 and 4 cannot be intelligently discussed because they are absolutely meaningless. The power factor of any circuit is the power factor of the whole circuit, and as I have previously noted, the power factor is unity in all radio circuits containing *free oscillations, and in all *forced oscillation circuits where the circuit has been tuned to resonance with the impressed frequency.

Very truly yours,
Ellery W. Stone,
General Manager.

*See definition of "free" and "forced" oscillations in the Report of the Standardization Committee of I.R.E.

It must be remembered that Mr. West's article was very frankly speculative, and as he himself said possibly faulty in spots technically, but was advanced for the purpose of stimulating thought on a subject that is by no means clear. We feel that it merits discussion only in the same spirit.

Mr. West's comments follow:

141 E. Fourth St.,
Waukegan, Ills.

Editor, QST—

Referring to attached, I have numbered the paragraphs in Mr. Stone's letter and will refer to them by those numbers.

Par. 1. This is obviously untrue. No such attempt was made or is effected. The statements therein are true. Radiation resistance may explain it BUT the Navy has not yet devised means to utilize in practise the knowledge concerning radiation resistance, its effect on signal strength and range, and its relation to total resistance, and until the Navy attempts to utilize this knowledge in practical work it is hardly to be expected that amateurs will be able to do so. The RESULTS can be attained, however, by experiment as has been pointed out.

Par. 2. The "optimum wave length" of a transmitter is the best wave of *the antenna* and may perhaps be explained in the manner mentioned but (until some *practical* method of determining the various resistances mentioned is devised) can better be determined by the amateur by experiment than by calculation from formulae, the values of the factors of which can only be approximated.

Par. 3. If resonance indicates merely that the capacitive and inductive reactances are neutralized, how can we have resonance at the same wave length with such widely varying degrees of these two factors, UNLESS as is stated in my article, page 22, in reference to Fig. 3, there be some *point* between L and C at which power factor is unity? This point may be inside of either L or C depending on their relative values but it seems to me absurd to state that any values of L and C which may be combined to produce a given wave length will produce unity power factor. Quoting from Wm. C. White, page 274, Radio News for Nov. 1920, "In order to get full output from a tube it is necessary to have only resistance effective in the circuit. Any excess values of inductive or capacity reactance means a heavier current for the same energy delivered (the so-called wattless component) and this component gives an added loss in passing thru the necessary impedence of the filament-to-plate path in the tube". It seems to me that the General Electric people are the only ones that are putting to practical use their knowledge of power factor and its relation to efficiency in radio circuits. It is the basis of several late patents and is the explanation of the effectiveness of the multiple tuned antenna. Let Mr. Stone explain: The closed circuit of a certain actual amateur transmitter has a voltage of 30,000 (estimated by distance jumped at gap) and an actual current in excess of 100 amperes (limit of ammeter). How does he account for the power in that circuit which, with an input to the transformer of 768 watts, will greatly exceed 300,000 watts if his power factor is unity? How, if the power factor is unity, can he account for the fact that the voltage of an amateur antenna often reaches a value that will jump ten inches (let's be ultra-conservative and call it 50,000 volts) with current measured by thermo-ammeter of 5.4 amperes, an apparent watt value of 270,000 with the same input of 768 watts?

Par. 4. May be. BUT WHY is there always a critical value of inductance and capacity for a given wave length that ALWAYS gives best results (both receiving and transmitting) if capacitive and inductive reactances are balanced at the wave length to which it is resonant? Why won't a short wave receiver work with a condenser across the secondary as well as it does when the capacity of the tube and windings are the only capacities present? In any case the fact remains that there is a relation of the values of capacity and inductance for every circuit, whatever may be its purpose, which gives best results for that purpose.

Par. 5. Can't agree. If Figs. 1 and 2 are correct (and I am informed they represent very accurately conditions often encountered in power distribution) I cannot see why Fig. 3 is not a sensible conclusion and from a purely logical standpoint Fig. 4 follows. Of course Fig. 4 seems hardly applicable to a spark transmitter but think a bit about some of the tube transmitter

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"hook-ups" and see if it may not perhaps be in common use altho somewhat modified. Any circuit in which L is divided between a coupling coil and a loading coil represents to some extent the condition shown in Fig. 4 and it is well known that for long waves VERY MUCH BETTER results are attained by that arrangement.

In conclusion. Mr. Stone seems to take extreme satisfaction in criticizing what I say rather than the ideas that I am trying to convey. Scientific knowledge is useless to the mass of humanity unless it is put in the form of simple directions of how to do things and so results in widespread good rather than the advantage to the few who can understand complex scientific terms. All these seemingly complicated treatises can be reduced to simple terms if the one who writes them will only see the other fellow's viewpoint and really try to do so.

Very truly yours,
M. B. West, 9DEA.

(In a freely oscillating circuit the current and voltage differ by ninety degrees. But it certainly seems true that there is but one combination of inductance and capacity to give the required wave length in the closed circuit of an amateur transmitter which will give the highest *resultant* power factor also.—Editor.)

A NEW SOUTHERN STATION

Editor, QST—
Dear Friend Warner:

This is to inform you of the fact that one of the star relay stations of the South is to be erected at Thibodaux, La., a city fifteen miles from our city, within the near future.

This station has been obtained for the Lafourche High School through the efforts of Messrs. John B. Taylor, Dr. Smith, Supt. Lafargue of the Lafourche Schools, Mr. Miller, Supt., Mr. Payne of the Lafourche Lumber Co., and Mr. Broussard, all prominent business men of the city of Thibodaux. This station has had not a cent spared to make it one of the best radio stations in the United States, the funds for the erection of same being raised by popular subscription, and generous donations from the committee in charge.

The site selected has not any metal work for a great distance, and will afford the American Radio Relay League one of the best stations of the South. The equipment will consist of 1 KW Acme transformer, Dubilier Condensers, Benwood enclosed gap, and T. & H. Radio Oscillation transformer for the transmitting unit. The receiver will be composed of specially built regenerative receptor, two stage amplifier, two pair of Baldwin phones, in connection with a Magnavox loud speaker, and special battery of storage and B battery cells to carry on the best long distance work that could be desired. This set will be conducted in connection with the physics class of the school, which will prove to be a tremendous benefit to the school, as well as the city of Thibodaux in general. We hope that all who hear this station will forward their station card, and will be greatly appreciated.

This is to wish all the boys around the home office the best of luck, and hoping that you all will report us, whenever you hear us. We are installing the set for the school, and have every faith that it will be an exceptionally fine one.

Sincerely,
F. L. Pullen, 5JE.

HI!

Baltimore,
March 7, 1921.

Dear Eddy—

After you have been to a convention and met all the important folks and come back and look thru your back QSTs and find you have pictures of almost all of them—AINT IT A GRAN' AND GLORIOUS FEELIN'?.

As one OW to another, I wanna tell the girl who fell in love with C. A. Service's picture that she just oughta meet him. That picture doesn't half do him credit.

Y.L.

FORMULA CORRECTION

Toronto, Ont.,

Editor, QST—

Re. "Measurement of High Resistance", p. 27, Dec. QST.

R_x does not equal

$$R_v\left(\frac{E_b}{E_v}-1\right),$$

which was probably a misprint, but equals

$$R_v\left(\frac{E_b}{E_v}-1\right).$$

My method of obtaining a formula would be:

$$\frac{R_x}{R_v}=\frac{E_x}{E_v}=\frac{E_b=E_v}{E_v}$$

where E_b is the open circuit voltage of battery as above.

73,
"Canuck Student".

A CAUSE OF QSS?

117 South Blakely Street,
Dunmore, Pa.

Editor, QST:

I have never seen or heard the following given as a possible reason for sigs fading, and I wonder.

This dope came to me while trying out CW stuff, using rectified AC. While using

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this for CW I noted, more than once, a drop in both the radiation, (on a very sensitive milli-ammeter) and also on the plate or space-current ammeter, when leaving the set running as straight CW. At first this had me guessing. But after rewinding and rewiring the entire set and many other changes, I finally checked up on it and found that this occurred mostly during the early part of the evening. Then in order to convince myself that this might be the theory, I had the Light Company install a recording voltmeter. After having this meter connected on for almost a week, I found that the voltage varied anywhere from 110, which is supposed to be normal, to as low as 85 volts and as high as 132½ volts. The curve was very irregular and at times made jumps from about 90 volts to 115 and then again it would run 110 for hours and then finally take a jump higher and sometimes lower and on a very long curve. Then is when I happened to think of how sigs faded. Remembering that they almost always run about five to fifteen minutes and then faded, I again checked up on the curve and found that it might be possible. You no doubt see my idea already; I will try and give it as clearly as possible:

Take in the case of a ½ KVA transformer, which is supposed to draw approximately 4½ amps at 110 volts or around 450 watts. But according to the curve above mentioned, suppose that the service dropped to, say, 100 or 90 volts, wouldn't it mean that there would only be less watts drawn by the transformer, according to the above voltage? Naturally less watts working upon the antenna would not have the same effect at the receiving end as when 450 watts had been put through, consequently there would be a drop in signal strength.

Furthermore, tuning in a station whose signals are QSA, requires a different setting than signals that are QRZ. Am I right, or is it my set? Then, coming back to this drop in service line voltage, wouldn't the signals become weaker when the line voltage drops, and if signals were coming QSA and you were tuned for them and then the service drops, causing the signals to become weaker, wouldn't it require the different tuning to keep him audible? Then if you did not change the setting, the signals would again come in QSA when the service came to normal again.

Now Eddy, I may have wasted some stationery and worn out a ribbon on this mill and have lost about a half hour's sleep, but just the same, I had to get it out of my system and you were the first one in mind, so don't think hard of me, OM.

Very truly yours,
Roy C. Ehrhardt,
Radio 8ZQ.

THE "BD" MYSTERY

Marion, Mass., 1HAA

Editor, QST:

Every so often something will happen that reminds me of the old days before there were and QR or QS signals, and when licenses were absolutely unknown.

'Way back in these days the Massie Wireless Co. had a ten kilowatt spark set in upper New York City on Jerome Ave. As rotary gaps were unknown, they had a straight spark gap and had her wide open. Without exaggeration, when they had the door opened we could hear the darn thing up in Mt. Vernon, some miles distant. He almost broke a leg trying to reach to the Massie station at Wilson's Point, Conn.—old "WN". The Long Island Sound boats were equipped with this same system.

How I laugh when I think of their detectors! They consisted of two horizontal carbon rods upon which they placed an oxided needle. Old Hiram Hilkens, who was operator on one of the tubs, was sure a scream with one of these detectors. Hiram wore glasses about a half inch thick, anyway, and every time the old tub gave a lurch the needle rolled off the carbons. After a vain search of the wireless cabin, Hiram would fish another needle out of his vest pocket and be all set again. It was a great life.

After a year or so of operation the Massie Co. went on the rocks, as did many other wireless concerns in those days. This meant the closing of old ten K.W. "BD" station on Jerome Ave. Now somebody, I'm not saying who, thought up the idea of making a visit to old "BD" and just "removing" the 10 K.W. to another location. So one dark and stormy night a truck backed up to the door and away went the transformer, key, condensers, helix and spark gap. This was great dope, and as nobody seemed to care a hoot, they thought they'd go back and get the tuner and stove, so hitched up the old mare and made a return visit. Ha! Strange to say, someone else had had the same idea a little ahead of time, for the whole works, shed and all, were gone. The only thing that was there was the mast—the aerial wires, even, had vanished with the shed.

I think I know where that shed is today, but whatever happened to the rest of the outfit the old timers only know. There were sure some mighty powerful sparks around our neighborhood those days. The old 5 K.W. I had—a Clapp-Eastham Type E—used to pull 53 amperes, 110 volts, on the primary. Our home-made rotaries a few years later were made of big wooden discs an inch thick and were 24 to 36 inches in diameter. The one I had was hitched to a 250 volt D.C. motor, and I just hurried it along a bit by putting 550 volts on it, which somehow or other

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mysteriously leaked off a trolley wire into my radio shack.

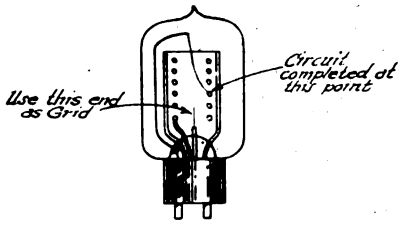
Sincerely,
Irving Vermilya.

"REPAIRING" TUBES

1617 19 St. N.W.,
Washington, D. C.

Dear Eddie—

Little things like burning out tubes dont worry me any more, for lo and behold, I have found a way to utilize dead tubes. I was examining a dead Moorhead the other day and noticed that one end of the fila-



ment had bent over and touched the grid, making a complete circuit thru the grid and filament terminals I immediately changed the connections of my socket, using the dead end of the filament as a grid and to my surprise, it worked nearly as well as a new tube. I have since "repaired" another tube in the same manner by carefully tapping on the glass until the filament touched the grid.

WL, OM, NM, nw, CUL,
A. R. McGonegal, 3AFW.

THE ROUTE TO ALASKA

Box 206,
Ketchikan, Alaska.

Editor, QST—

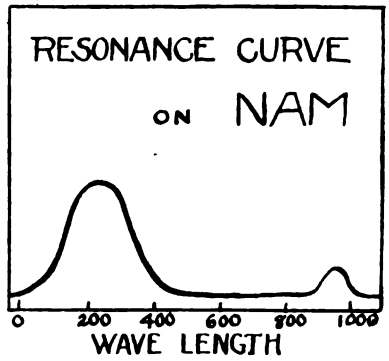
As yet no radio amateur has communicated with amateurs in the states via the ether. As practically all of the Alaska towns have Government stations, the power allowed amateurs is only one-half kilowatt. With this power there is very little possibility of anyone here being heard as far south as Seattle, except possibly on rare occassions. One of the electricians stationed at the local Naval Radio Station reported to me that 7CU of Vancouver, Wash., came in clear using an aerial of about 350 meters natural wavelength, and only a one step amplifier. He said there were many others heard, but "too many cooks spoil the soup" so he couldn't get their calls.

However, it is possible that a half K.W. could be heard in British Columbia, at least as far as Prince Rupert which is about 20 miles from Ketchikan. In this manner messages could be relayed, during the winter at least. But the principal difficulty encountered is this: Are there any amateurs in Prince Rupert or vicinity who have, are allowed or else have the means to get a half K.W. installed? For this reason I am writing to you, to find out whether you know of any Radio Amateurs, hams or otherwise, in the above mentioned vicinity.

If you do know of any would you please let me know, as I am anxious to help in opening a relay route from Alaska, either this spring or next fall.

Yours respectfully,
Roy Anderson of Station 7IT.

(Will anyone with knowledge of amateur station possibilities in the vicinity of Prince Rupert, B. C., communicate with us or Mr. Anderson?—Editor.)



FEBRUARY STATION REPORTS

(Concluded from page 54.)

9ZJ—9ZL—9LQ 9ZJ—9ZL—9LQ

Remarks

First District. No consistent stations; 1AW heard occasionally and some others less frequently.

Second. 2RK very loudly at times, other stations irregular and usually lost in QRM.

Third. 3EN seems to have come back to life as we are hearing him more often again. 3HJ seems to have dropped off the map. None of the others come in very well. 3GO heard pretty well on a few nights recently.

Fourth. 4YB not working much this month. 4XC best we have heard. Heard a number of other 4's but none very loud.

Fifth. Much the same as last month but with 5ER dropping out and 5YE coming in more often.

Sixth and Seventh Districts. No stations logged from these districts athough we almost thought we heard a 6 one night.

Eighth. Where is 8ZL? We have them logged on only one occasion when they came in strongly. 8ZR seems to be in the lead now. There is a flock of good special stations in the Eighth District, among them 8XA, 8XE, 8XK, 8ZA, 8ZD, 8ZH, 8ZL, 8ZO, 8ZR, 8ZW and 8ZY. Some of the other eighth district stations seem to think that the wave length law does not mean anything. We have heard regular amateurs on wave lengths up to 400, we know, because we have measured them.

Ninth. Same stations as last month are doing the work. Our neighbor, 9KR at Lebanon, seems to be quite active and is reaching out somewhat. Some of the ninth district boys are stretching the wave length law also.

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QST'S DIRECTORY OF CALLS

ADOPTING the Department of Commerce's list of amateur stations as it's standard, QST will publish each month the calls of new stations in each district commencing where the government book stops. To make this possible, amateurs are requested to report new or changed call letters to this office.

FIRST DISTRICT

A. R. Findlay,	391 Windsor Ave., Hartford, Conn.	1GBP
E. E. Parmenter,	3 Sheldon Pl., Waterville, Me.	1GBQ
R. E. Hull,	169 Lothrop St., Beverly, Mass.	1GBR
H. G. Ringwood,	29 Arnold St., Boston, Mass.	1GBS
S. S. Heap,	132 Atlantic St., Atlantic, Mass.	1GBT
Boardman H. Chase,	39 Chester Ave., Winthrop, Mass.	1GBU
James P. Saunders,	15 Cherry St., Salem, Mass.	1GBV
Frederick E. Hue,	183 Winthrop St., Winthrop, Mass.	1GBW
Warren F. Priest,	Foster St., Littleton, Mass.	1GBX
Wm. T. Chase,	16 Evans St., Dorchester, Mass.	1GBY
Arthur L. Spring,	25 Loring St., Newton Center, Mass.	1GBZ
Warren A. Ford,	855 Massachusetts Ave., North Adams, Mass.	1HBA
Gordan Wells,	139 East Cottage St., Dorchester, Mass.	1HBB
Richard F. Shea,	668a Dudley St., Roxbury, Mass.	1HBC
Clarence H. Morse,	33 Union St., Mansfield, Mass.	1HBD
Albert A. Sears,	14 Erin St., Whitman, Mass.	1HBE
Arthur L. Fern,	12 Essex St., Hartford, Conn.	1HBF
Robert E. Gray,	234 Thomas St., Groton, Conn.	1HBG
Laurence B. Cheney,	R. F. D. No. 1, Southbridge, Mass.	1HBH
Robert V. Howard,	Loomis Inst., Windsor, Conn.	1HBI

SECOND DISTRICT

J. P. Jessup,	93 California St., Ridgewood, N. J.	2AUG
Clifford Holman,	Highland Park, New Brunswick, N. J.	2AZY
G. Curtis Engel,	181 Upper Blvd., Ridgewood, N. J.	2BBB
A. L. Wilcox,	424 Tremont Ave., Westfield, N. J.	2BEL
Thos. Robinson,	226 Lincoln Ave., New Brunswick, N. J.	2BER
H. C. Hogencamp,	623 E. 22d St., Paterson, N. J.	2BID
Paul Rank,	319 Union St., Union Hill, Weehawken, N. J.	2BJB

THIRD DISTRICT

Roy W. Geiger,	Oringsburg, R. R. 1, Penna. (Reassigned)	3UA
E. H. Velutine, 3d,	1931 N. 23d St., Philadelphia	3AAE
Jas. Curry,	Box 293, Hilton Village, Va.	3AAG
Geo. Butler,	647 N. 12th St., Reading, Pa.	3AAI
Carl Kunsman,	519 Penn. St., Reading, Pa.	3AAF
R. M. Lacey,	11 Mills St., Morristown, N. J.	3ABG
Ralph Hartman,	440 Mulberry St., Reading, Pa.	3ABO
Walter Hoffman,	1014 Green St., Reading, Pa.	3AEN
Edw. Beeler,	2432 W. Morris St., Philadelphia	3AEQ
Harold Monyer,	1034 Court St., Reading, Pa.	3AFH
Russell Kutz,	330 No. 10th St., Reading, Pa.	3AGC
R. L. Wilson,	1706 Race St., Philadelphia	3AJM
Elmer Jones,	Wyncote, Mont. Co., Penna.	3AKU
W. K. Koch,	1521 N. 17th St., Philadelphia	3ALL
W. Russell Scargle,	801 Baltimore Ave., East Lansdowne, Pa.	3AMY

FOURTH DISTRICT

C. J. and Eugene White,	510 Park Ave., LaGrange, Ga.	4DT
A. C. Robinson,	1503 University Ave., Gainesville, Fla.	4DW
Frank Dodd,	Vernon St., LaGrange, Ga.	4DX
Henry H. Pike,	Park Ave, LaGrange, Ga.	4DY
A. J. Cook,	Flat Shoals Road, RFD, Atlanta, Ga.	4EE
W. C. Ether	Woodruff, S. C.	4EG
G. G. Trammel,	25 Milledge Ave., Atlanta, Ga.	4EI
Thurston Hatcher,	142 Adams St., Decatur, Ga.	4EK
R. L. McCall,	99 E. Merritts Ave., Atlanta, Ga.	4EM
Charles Kelly,	Moreland Ave., Atlanta, Ga.	4EO
Bela Winterkorn,	Glenwood Ave., Atlanta, Ga.	4EQ
H. H. Snyder,	211 Central Ave., Atlanta, Ga.	4FM
T. Green,	707 S. Boulevard, Atlanta, Ga.	4FQ
Georgia School of Technology	Atlanta, Ga.	4YA
Knights of Columbus Radio School,	Marist College, Atlanta, Ga.	4YJ

FIFTH DISTRICT

G. M. Cornelius,	Seminary Hill, Ft. Worth, Tex.	5LC
Bryce Ballinger,	Box 747, Miami, Okla.	5LO
Geo. Johnston,	1457 Milner Crescent, Birmingham, Ala.	5LP
Guy W. Neel,	Dublin, Texas (Ex-5BI),	5LR

SIXTH DISTRICT

C. R. Henry,	626 3d St., Napa, Cal.	6ACA
M. P. Gilliland,	117 Foothill St., Pasadena, Cal.	6ACB
W. D. Johnson,	4346 Townsend Ave., Oakland, Cal.	6ACC
A. L. Walker,	6th & Lay Sts., Winnemucca, Nevada	6ACD
W. H. Westerman,	3219B Adeline St., Berkeley, Cal.	6ACE
E. Pack,	6451 San Pablo Ave., Oakland	6ACF
M. H. Hurt,	289 W. 14th St., Riverside, Cal.	6ACG

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C. E. Thompson,	1876 15th St., San Francisco (Portable Station)	6ACH
I. A. Coffey,	75 E. Santa Clara St., San Jose, Cal.	6ACI
M. H. Hurt,	289 W. 14th St., Riverside, Cal.	6ACJ
L. H. Atkinson,	1306 Filmore St., San Francisco	6ACK
A. Brooks,	432 Lyon St., San Francisco	6ACL
L. Newman,	1700 Sonoma Ave., Berkeley, Cal.	6ACM
R. W. Kerrigan,	2848 Harrison St., San Francisco	6ACN
H. C. Robom,	2069 O'Farrel St., San Francisco	6ACO
R. K. Salisbury,	400 Wilcox Ave., Oroville, Cal.	6ACP
H. W. Scribner,	28 Presidio Terrace, San Francisco	6ACQ
T. A. Work, Jr.,	181 Central Ave., Pacific Grove, Cal.	6ACR
H. F. Thornton,	Arcata, Cal.	6ACS

SEVENTH DISTRICT

Melvin Van Scoyoc,	Orting, Wash.	7JS
Norman R. Hood,	1022 So. Ash St., Casper, Wyo.	7KX
Carl V. Finch	201 S. 6th St., Bozeman, Mont.	7MB

EIGHTH DISTRICT

Following reissued calls; cancel assignments in Call Book:

Ralph Gaylord,	338 Sackett St., Cuyahoga Falls, Ohio	8HE
Beaver High School,	2d & Market, Beaver, Pa.	8MB
B. T. Dreyer,	1516 Montclair Ave., Detroit	8KH
Wm. McKenzie,	430 Floyd St., Toledo, O.	8KO
F. A. Hamel,	200 Martin St., Amherst, O.	8QH
R. W. French,	1675 Pilgrim Pl., Akron, O.	8UQ
Chas. C. Davis,	411 Poplar St., Fenton, Mich.	8ADY
Bellevue High School,	Bellevue, Pa.	8AGY
Thos. B. Keller,	1362 W. 76th St., Cleveland, O.	8AJO

Following are new calls:

Robert F. Coushaine,	102 Norwalk Ave., Buffalo, N. Y.	8ALZ
Palmer H. Craig,	3397 Glenmore Ave., Cincinnati, Ohio	8AMA
Joseph Buehlmann,	78 Garfield St., Lancaster, N. Y.	8AMB
Clarence M. Voll,	152 Johnson St., Buffalo, N. Y.	8AMC
Lloyd W. Laird,	18 N. Race St., Greenville, Pa.	8AMD
Howard B. Blodgett Mouatt,	264 Field St., Rochester, N. Y.	8AME
Harry E. Blewitt,	1032 Orange Ave., Youngstown, Ohio	8AMF
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The Official Organ of the A.R.R.L.

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QST

A Magazine Devoted Exclusively to the Radio Amateur

The Antenna*

By John C. Stroebel, jr., 8ZW

There is a surprising dearth of data on aerials and their behavior. We do not know nearly as much about what is good aerial design as we do about the design of the rest of our apparatus. QST therefore feels that Mr. Stroebel's article will be received with welcome and will stimulate some hard clear thinking on the part of our readers.—Editor.

THE main object of this paper is to show how the fundamental wave length of an antenna varies according to dimensions apart from its actual length.

Thruout the discussion, unless otherwise stated, it is the fundamental wave length, i.e., the wave length of the antenna alone, without any added inductance or capacity, that is referred to. Standard symbols, λ for wave length, C for capacity, and L for inductance will be used.

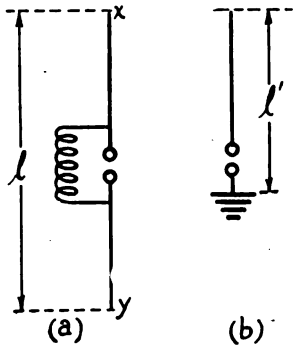


FIG. 1

Consider first a simple Hertzian oscillator of length, l, shown in Fig. 1 (a). An electric charge oscillating from x to y and return, with the velocity of light, sends out ether waves horizontally at the same velocity; hence a pulse moves out a distance of $2l$ while the charge goes thru one complete cycle. This distance moved will be one wave length, λ. Thus $\lambda = 2l$; i.e., the wave length will be twice length of the oscillator.

If the upper half only of the oscillator is used, and a ground connection substituted for the lower half as is usually done in practise, it does not change the frequency or λ materially; thus for a single vertical wire connected to earth, $\lambda = 4l'$ [See Fig. 1 (b)]; i.e., fundamental wave length equals four times the total length of wire.

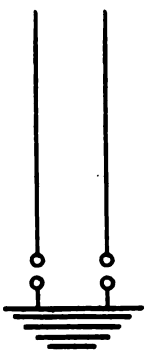


FIG. 2

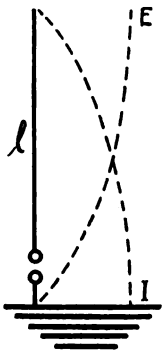


FIG. 3

A simple vertical wire antenna is rarely used in practise. Maximum efficiency results when the working wave, obtained by inserting a few turns of inductance in series, is not greatly in excess of the fundamental. The height necessary to obtain even a comparatively short wave length in a vertical aerial makes construction difficult and cost prohibitive. Therefore the usual practise is to go as high as possible vertically and then run

* A paper read before the Second Annual Convention of the Third Amateur Radio District at Philadelphia, Feb. 26th.

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out horizontally, forming the inverted L antenna.

Where the horizontal part is comparatively high above the earth and the horizontal length not much over twice the height, the wave length of a single inverted L wire is not materially different from that of a simple vertical wire of same total length; i.e., $\lambda = 4l$.

A single wire has rather low capacity, hence large powers build up excessive potentials, making losses high, insulation difficult and efficiency low. Increasing the number of wires increases C and overcomes these difficulties but complicates the determination of the fundamental λ. Besides possessing a certain capacity, C, an antenna has a certain inductance, L. The C is due to the shape and intensity of the electrostatic field around the antenna when fully charged. The L is due to the shape and intensity of the magnetic field set up around the wires by the oscillating current on discharge.

When a complex form of antenna is used its wave length is usually influenced and determined by factors aside from its actual length. If the L and C are known, λ may be determined by means of the formula $\lambda = 59.6 \sqrt{(LC)}$, where λ = wave length in meters, L the inductance in centimeters (cm.) and C the capacity in microfarads (μf). Evidently anything that influences L or C will influence λ, so λ is proportional to $\sqrt{(LC)}$. This $\sqrt{(LC)}$ is known as the oscillation constant.

A simple application of this formula follows: An antenna of length l has a certain L and C and therefore a certain λ. If the length l is doubled, both L and C are doubled, making the product LC four times its former value. But $\sqrt{(LC)}$ will be only twice the former value, hence doubling length of an antenna doubles λ. Two antennas having the same oscillation constant, i.e., the same product of L and C, will have the same λ regardless of the individual values of L and C.

Now let us see what effect an increase in the number of wires has upon the wave length. Consider two wires, either vertical or inverted L, spaced a uniform distance thruout their length, from tip to ground. The extent of the electrostatic field is increased and therefore C is increased. But the magnetic field is now divided between the two conductors and the electrical inertia or self inductance, L, has been decreased to same extent that C was increased so that $\sqrt{(LC)}$ and therefore λ remains the same as before. Increasing the number of wires increases C but further reduces L, maintaining $\sqrt{(LC)}$ and λ constant so that for any number of wires *uniformly spaced thruout* their length λ is the same as that of a single wire of the entire system, which equals approximately $4l$.

Manifestly in practise the wires must be brought together at the lead-in to connect thru a single receiving or transmitting apparatus to ground, so that L is decreased somewhat less than C is increased by use of multiple wires, resulting in a $\sqrt{(LC)}$ and λ somewhat higher than that of single wire. But it will be shown that the point at which the bunching of the leads occurs determines what the increase of λ will be.

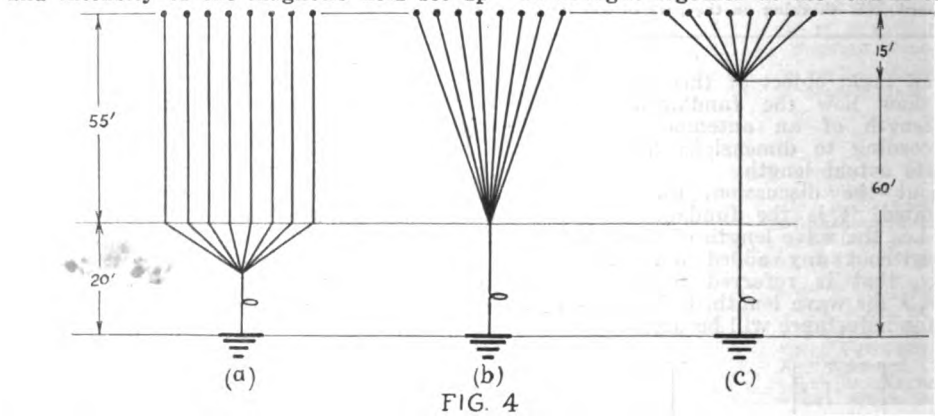


FIG. 4

It is advisable at this point to consider the voltage and current distribution along an antenna system. This distribution is *non-uniform* and the effective C and effective L are influenced very decidedly by this non-uniform distribution. See Fig. 3. The voltage, E, is zero at the base of an antenna and a maximum at the free end. Conversely the current, I, is greatest at the base and zero at the far end. The rise or fall of E or I as we proceed from the base to the far end is not uniform but varies approximately according to curves shown in Fig. 3.

The intensity of the electrostatic field between antenna and earth being greatest at the point of maximum potential, the

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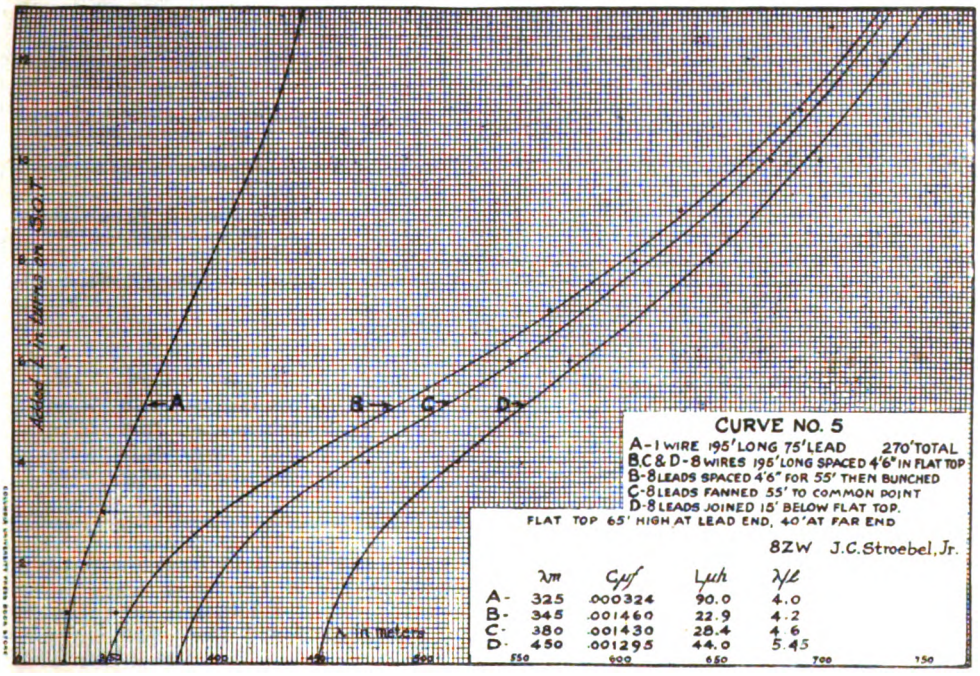
effective capacity of any form of complex antenna is increased by fanning out the wires at the far end. Conversely, the maximum current being greatest at the base of the antenna, a single conductor or rat-tail of closely bunched wires for the lead will concentrate the magnetic field and give a maximum effective inductance.

Thus in an inverted L (or T) antenna, the wide separation of the wires in the horizontal part (or especially at the far end) and the bunching of the lead into a single rat-tail, gives the conditions of both maximum C and maximum L, hence maximum λ for a given total length of antenna; and λ often reaches $6l$ instead of $4l$ (as for a single wire). The extreme case for these conditions occurs in the umbrella antenna where λ may reach a value of $8l$.

The effective C of an antenna is also increased to some extent by decreasing the height of the free end above the earth but in practical work this effect is usually negligible (except where the free end is very low, in which case C and therefore λ may materially increase.) Therefore the λ of an inverted L antenna of uniformly spaced wires is approximately the same as that of a vertical system of the same linear dimensions, and as already stated $\lambda = 4l$.

In a given horizontal system, if the lead be taken off the center instead of from one end, the T antenna results. L and C are both reduced, consequently the λ of the T will be less than the inverted L type. The total length in this case is sometimes figured as vertical length plus ½ of the total horizontal length. This is only approximately correct, as the fundamental λ of a T type 100 ft. long and 50 ft. high will be somewhat greater than that of an inverted L type 50 ft. long and 50 ft. high but considerably less than the λ of an inverted L type 100 ft. long and 50 ft. high.

The T type is no doubt the best all round antenna for general amateur or other work that must be carried on on restricted wave lengths. Directional effects in both transmitting and receiving are not nearly so pronounced in the T as in the inverted L type.



The fan or harp antenna is possibly best of all but due to the excessive height required for large C and efficient work, constructional difficulties and cost make it beyond the reach of the average amateur. Its directional effect is small, the radiating qualities are considered good, and the wave length is usually low enough to work on short waves without difficulty. However, a properly designed inverted L or T may be equally or nearly as good as a fan.

It would seem that an antenna which covers the maximum length and spread of wires for a given fundamental λ would best suit the needs of the amateur. This results when wide separation of both horizontal and vertical wires is made use

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of. Consider the type of inverted L antenna often used where widely spaced wires in the flat top are terminated by a lead or rat-tail of wires closely bunched just below the flat top. As previously stated this gives conditions of both maximum L and maximum C and therefore maximum λ for a given overall length. If these closely bunched leads are separated as in flat top, until very close to the lead-in insulator, the fundamental λ will be less than before, and this without cutting down the total length a particle. The reason is easily seen. Separating the leads has increased the effective C, but only slightly since we are at the low voltage end of antenna. On the contrary the effective L has been *decreased* considerably since we have separated the wires at the maximum current end. And since L has decreased more than C has increased, √(LC) and therefore λ has decreased. The above theory has been fully verified thruout by experimental evidence.

A number of measurements have been made of several different types of aerials used at 8ZW. In one case, variations of the wave length of an antenna using different types of leads are shown in the curves of Fig. 5. The flat top used in each case consisted of 8 wires 195 ft. long spaced 4.5 ft., (32 ft. spreaders) 65 ft. high at lead end, 40 ft. high at far end. Length of lead—including ground—75 ft. Total length of 270 ft. used thruout.

The curves give wave lengths, fundamental and natural, using various values of series inductance on oscillation transformer secondary. Curve B, was obtained with lead of 8 wires separated 4.5 ft. (as in flat-top) for 55 ft., and then converged to a single rat-tail of 8 wires bunched as shown in Fig. 4 (a); curve C, with leads fanned as shown in Fig. 4 (b); curve D, with leads bunched 15 ft. below flat-top as shown in Fig. 4 (c).

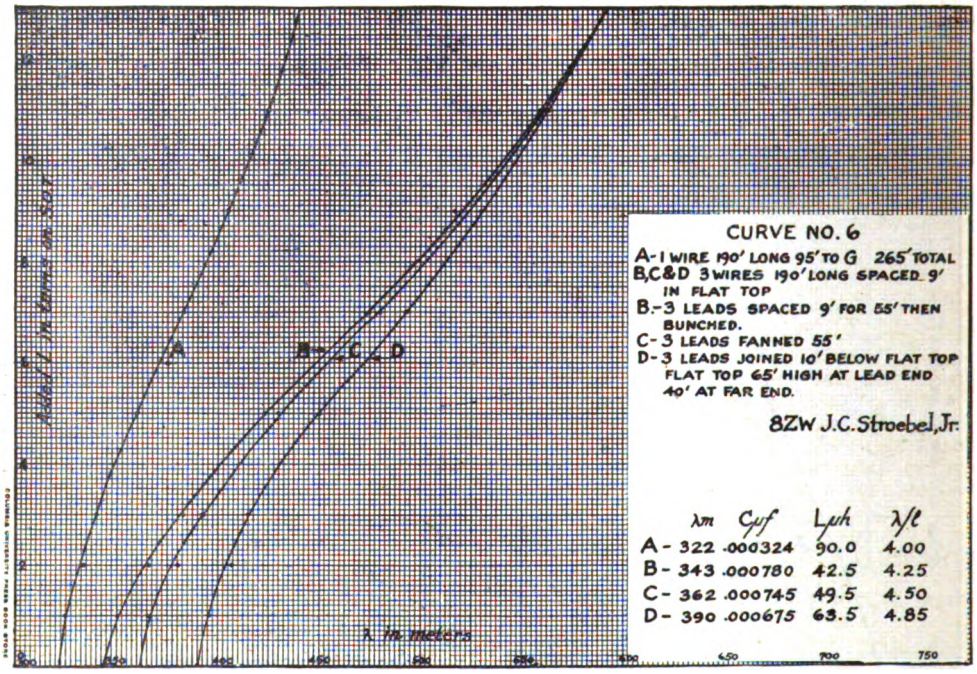


TABLE I

Data for Figs. 4 and 5.

	λ	Cμf	Lμh	Ratio— λ/l
Single wire	325	.000324	90.0	4.0
Leads spaced 4'6"	345	.001460	22.9	4.2
Leads fanned	380	.001430	28.4	4.6
Leads bunched	450	.001295	44.0	5.45

Tests were also run on another antenna 190' long, 65' high at lead end, 40' high at far end, lead to ground 75' long, total length 265', first as a single wire, then 3 wires spaced 9' apart, with following results:

TABLE II

	λ	Cμf	Lμh	Ratio— λ/l
Single wire	322	.000324	90.0	4.00
Leads spaced 9'	343	.000780	42.5	4.25
Leads fanned	362	.000745	49.5	4.50
Leads bunched	390	.000675	63.5	4.85

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The curves of Fig. 6 show λ with series L added. Changes in λ with change in lead spacing are not so marked in the second case, due to fewer wires and shorter spreaders used. Both experiments fully verify the theory involved, however.

It may be argued that the aim for maximum efficiency and best radiating qualities is to get the center of capacity as high as possible to produce maximum electrostatic field about the antenna and maximum current with strong magnetic field in and around the lead. And this is usually accomplished by spreading the wires in the flat-top and bunching the leads. However, spreading the leads increases the effective C very little, thus lowering the center of capacity very little. On the contrary spreading the leads decreases the effective L to such an extent that $\sqrt{LC}$ and λ are reduced materially, as already pointed out. This reduction would permit the lengthening of the flat-top to increase and restore λ to its original value, with consequent increase of C (materially increasing the effective C since it occurs at the high-potential end) at far end, thus tending to neutralize the effect of the lead capacity to lower the center of C. Therefore the latter will be maintained high above the earth, and the increased length of antenna is clear gain.

Another important point follows. The curves of Fig. 5 and 6 will cross if λ is increased by continued addition of higher values of series L. Since the effective C of an antenna with spread leads is greater than one with bunched leads, a large honeycomb coil will load the former to a longer λ than the latter. Fig. 7 illustrates this. Thus A gives lower minimum and higher maximum λ than B, which is obviously of considerable advantage. Furthermore, spreading the wires in the lead where the current is greatest reduces the skin effect by increasing the area of conductors, thereby reducing high frequency resistance.

Where the leads are separated widely, swinging of leads with consequent changing C is less marked, with little variation of λ on C.W. and phone signals, while wires swinging with respect to external objects would vary C and therefore λ making tuning difficult to maintain. Wires swinging with respect to each other should have little effect, since wider separation would increase C but decrease L (closer swinging decrease C and increase L), thus maintaining $\sqrt{LC}$ and λ practically constant.

Several well known points may be mentioned in passing. The high-potential far end requires better insulation than other parts of an antenna. The importance of getting all wires exactly the same length must be emphasized. Especially if a T type antenna is used, wires should be taken from the *exact* center, since it is hard to see how oscillations can traverse unequal lengths of wire in same time period. Thus double waves would be set up, if lengths are unequal. If local obstructions prevent leads being taken off the extreme end of wires, and a T type is impossible or undesirable, the short ends of the flat-top should be separated from the leads by insulators.

The necessity of having all joints soldered is well known.

Whether the separate wires in a flat-top are all connected together at the ends or left open is largely a matter of individual opinion. If the wires are of unequal length, jumpers may equalize matters and possibly reduce brush discharge slightly, but no other advantage is obvious.

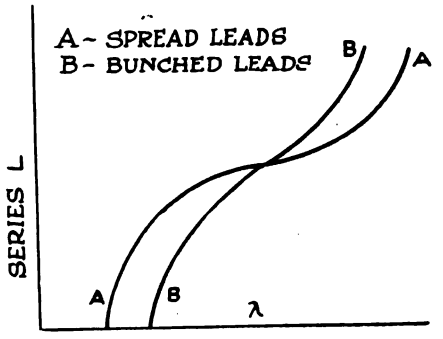


FIG 7

At present the star or cage antenna is in use at 8ZW, and seems to be best type yet tried out. Five wires on X spreaders 18′ long form flat top. A wire is run from the end of each spreader and one from the center of the X. Separate leads are brought down to another X spreader 9′ long, near the lead-in insulator, and finally bunched where the wires enter thru plate glass window. The average length of horizontal wires is 125 ft., average height 70 ft., total length of each wire from ground to far end exactly equal—210 ft. Additional data and constants may be available at a later time.

The writer has not attempted to exhaust the subject but rather to point out certain general and underlying principles that will enable all to get a clearer understanding of the matter and settle much of the doubt which seems to exist in the minds of many experimenters as to the best type of antenna.

The second article on The Ideal Spark Transmitter, by R. C. Denny, 6CS, will appear in the next QST. Watch for it.

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Breaking Out

By M. Adaire Garmhausen

"Strike the concertina's melancholy string,
Blow the spirit-stirring harp like anything,
Let the piano's martial blast
Rouse the echoes of the past,
For of Hook-up, King of Maladies, I sing."

DON'T get nervous, I'm not going to sing; that's poetic license. What I mean is, I'm going to discuss that terrible affliction, common, I suppose, to all of us, known as "breaking out with the Hookups." Perhaps to those who profess to be authorities on CW and "sich like" this phase of the ham business is ancient history, and yet I have an idea that it is a repeating disease, and that you never can be sure just when it is going to break out again.

Say the first spell comes over you as you are looking thru an old trunk, or pile of old magazines, and you find the diagram the Independent used in wiring the Ark. Just for the fun of it, you fall to and dig up that last piece of galena you discarded back in 1492, and try Noah's diagram; after you get it all connected up the signals are so faint that you can't be sure whether it's working or not. Can it be that you ever actually depended on that silly little crystal! Why you can't even hear 2RK! Oh my, you couldn't possibly get along without hearing 2RK, so



"....put the Crystal in your ear and your ear to the ground...."

you kick it across the room and turn to the cheerful little bulbs on the table. And then, in your zeal, you burn out one or more of said bulbs. Oh mother, another week's salary gone wrong! This is too much; you simply can't afford to buy another bulb this year. Then you start to THINK. Why monkey with a lot of apparatus! Somebody ought to invent apparatusless wireless! Why not you! Your eye falls on the loathsome crystal. Let's see now—here's a start. If you connect the aerial directly to the ground, put the crystal in your ear, and your ear to the ground why couldn't you hear POZ? While in the act of carrying out this experiment an angleworm comes up and strolls across your face, so you abandon the project and decide to retain a little apparatus for the



"....a dim idea that you might discover something about crystals."

time being. It would never do in southern countries anyway—you might put your ear on an anthill or a rattlesnake—horrors!

Back to the antediluvian magazines—and you find a bunch of crystal hook-ups. Thereafter, days and nights are spent in trying and discarding each. Perhaps you have a dim idea that you might discover something immensely important about crystals. Unfortunately each and every diagram seems to call for at least one small but urgent piece of apparatus which you do not possess, and still more unfortunately, none of the hook-ups give what even the most tolerant could call results. You can't kick it away now because by this time you have completely walled yourself in with discarded junk, so you throw it as high over the wreckage as you can reach and turn again to the bulbs. Even if all the crystal's secrets are bared to Science, those of the bulb aren't. Maybe you could find a way to make the remaining bulbs do the same work as the original number. So you fall to work with redoubled vigor determined to startle the world with your discovery. As each idea fails your enthusiasm wanes and then suddenly you show the first glimmer of returning intelligence. You realize that the money you wasted on the crystal

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hook-ups would have bought you two bulbs, and that as long as you were getting perfect efficiency out of your old arrangement it was foolish to change it. The disease has now spent its fury and you have spent every cent you own, so you sell the family jewels, replace the burnt-out bulbs, and hook them up exactly as they were originally.



"Hams (m.) do this....hams (f.) burst into tears.

I suppose this malady attacks different ones with different degrees of violence, but any case is bad. You break out first with a bunch of new ideas, you break out into profanity when they do not—[hams (m) do this, I am told; hams (f.) burst into tears]. Now that I have safely passed thru my first attack I consider myself one of the gang, other peoples' opinions to the contrary notwithstanding! I have piles of worthless junk lying around, and my room looks more like a blacksmith's shop than a young lady's "boojwar," but I can't say I am any the wiser. My sore and swollen fingers have taught me when to use pliers and the smell of burning shellac has taught me not to put twelve volts on a six volt buzzer. They told me I followed the customary rule in breaking in, so I guess I broke out the usual way, too. Did I?

The $100 C.W. Set

By K. B. Warner.

A WESTERN amateur writes us as follows:

"In the March issue, just received, you say that mile for mile C.W. transmission sets may be put in as cheaply as spark. I hope you are correct in this statement and, knowing nothing about it, I am going to ask you to devote space enough in QST to back up your statement by outlining in a general way a C.W. set that will transmit as far as a $100.00 spark set consisting of

Transformer (1 k.w.)	$30.00
Condenser	30.00
Rotary Gap	30.00
O.T. (home-made)	10.00
	$100.00

"Can you show me, and many others, how to put in a C.W. set for $100.00 that will transmit as far as such a 1 k.w. spark set? If so, such an article in QST will meet with much approval."

•

The General Design

We gladly accept the challenge. The problem is not very difficult. First we should consider the power necessary, and we're going to prescribe 20 watts of C.W. energy. Half that probably would be sufficient, but we can afford 20 watts on the basis of a $100 set. If anyone think us over-optimistic, let them remember that spark sets are rated on their input and American vacuum tubes on their antenna output. Fifteen percent overall efficiency probably is a fair average for amateur spark sets, making 150 watts in the aerial circuit. No one, we trust, will question that 20 watts of straight C.W. energy is the equal of 150 watts of spark-train energy.

As to plate supply: If we had to figure on a motor-generator set, or a step-up transformer and kenatron or electrolytic rectifiers and a filter, we admit the problem of building a 20-watt set for $100 would be difficult if not impossible. However, as we have endeavored to point out before, recent developments in the use of A.C. on the plate without extra appurtenances, in circuits where the action is called "self-rectifying" (as originally described in QST for December, 1920, and further discussed on pp. 51-52 of QST for February, 1921, q.v.), has provided a solution to the matter. A.C. is transformed to the required voltage and more or less smoothed out by a large choke—no other apparatus is necessary for the plate supply and the system lends itself well to our use. We shall therefore use self-rectification.

There is a world of oscillating circuits but those performing best these days are the simpler ones using just a plain helix

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one of several good schemes. Since we can use an ordinary helix we may promptly dismiss visions of costly coil systems with sliding couplings, rotatable ticklers, etc.

In the following paragraphs we will describe the installation and operation of a 20-watt C.W. set calling for the following material:

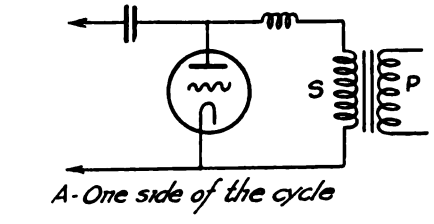
4—U.V. 202 Radiotrons, 5 watt, @ $8.00	$32.00
4—good Sockets @ $1.75	7.00
4—Rheostats able to carry 2½ a. @ $2.00	8.00
1—C.W. Helix	10.00
1—ordinary air Variable Condenser, small	5.00
1—C.W. Transformer, supplying plates and filaments	26.00
1—iron-core Choke of high reactance	9.00
2—small glass Condensers, and Sundries	3.00
	$100.00

The Plate Supply

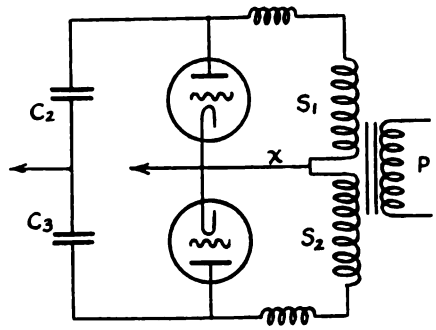
Our readers are asked to review the beforementioned articles on self-rectification, as we cannot herein again go thru the theory. A in Fig. 1 represents an A.C. supply to a tube whereby one half of the A.C. wave is utilized and the other (when the plate is negative) is lost. Connections to the left, as indicated by arrows, would go to the oscillating circuit. Then referring to B in Fig. 1 it should not be hard to see that if there were *two* tubes, and *two* transformer secondaries, so that one plate or the other would be positive, both halves of the cycles would be used, the tubes alternating in oscillating. The plate lead to the oscillating circuit is taken from the center point between two blocking condensers which are necessary to prevent shorting the transformer. Now as discussed particularly on page 52 of February QST, the two half-cycle waves overlap in the antenna circuit, producing a continuous output. If a large reactance is connected at X, Fig. 1-B, the supply modulation will be reduced still further. Prof. G. D. Robinson of the U.S. Naval Academy, Annapolis, advises us he has taken oscillographs of such a circuit and, using an iron-core choke at X, finds the output much nearer constant than F of Fig. 4, page 52, February QST. The Radio Corporation of America is bringing out such a set for amateur use, and a 50-watt model of same when tested at 2ZL, New York, was heard at 5ZA, Roswell, N. M. 8XK, Pittsburgh, reported 3000 miles, uses self-rectification; Mr. Conrad's results prove what can be done. Using a 125-henry reactance at X, rather the ultimate in chokes, he finds the supply modulation *in the antenna* reduced to as little as 5%. Do these results satisfy our readers that the scheme is practical?

It distinctly is to be understood that this circuit is absolutely unsuited to non-oscillating reception. The idea is to iron out the 60 cycle hum by the choke at X, and heterodyne it at the receiver the same as if the supply were D.C.

Now refer to Fig. 2, wherein these principles are applied. The transformer used is a so-called "CW transformer", of which there are several makes on the market. Originally intended for kenatron rectification they already have a double secondary and a filament winding, both with center taps. Other such transformers will shortly be available. For best results with U.V. 202's the voltage across *each side* of the secondary should be about 1000. This allows for a reasonable drop in the choke L_2. Altho still higher than the rated



A-One side of the cycle



B-Both sides of the cycle

FIG 1

voltage of the tubes, remember that neat dissipation is the limiting factor in their rating and in this circuit any one tube will be idle 50% of the time; therefore much higher voltages may be used in entire safety. The size of C.W. Transformer commonly called "200 watts" is about right for this circuit. Altho such output is higher than necessary for the plates of these tubes, it should be remembered that the filaments also are to be lighted by the transformer, and some leeway is further desirable to provide for increase in the number of tubes if later desired.

The secondary center tap going to the filaments, the outside terminals go to the plates. The tubes are divided into two groups of two tubes each, all filaments and grids in parallel, and the plates of each pair paralleled to receive the voltage. L_1

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and L_4 are high frequency chokes to prevent the oscillations from backing up thru the transformer, and are essential. Honeycombs of 200 or more turns are recommended here, but any similar inductance will do. Blocking condensers C_2 and C_3 are inserted between the two pairs of plates, with a center connection to the oscillating circuit. Any capacity in the neighborhood of .002 mfd. is proper here. The builder will note that one condenser of .004 mfd., with a center tap, will be the same. Four glass plates 8" x 10", with tinfoils on each side 6" x 8", with a center tap, answer well and cost very little.

The center tap of the filament winding is the common point for attachment to other circuits. The key and the choke L_2 are inserted in the lead from this point to the secondary center tap. If L_2 were infinitely large in reactance, practically all supply modulation would be ironed out. If no reactance is used, the "60-cycle hum" is bothersome. The value used will depend on the extent to which the builder cares to go in search of perfection. Experimental use may be made of transformer windings, etc., already available, but they should be of relatively low ohmic resistance. We would sugest 25 henries as a practical value, altho pointing out that the cost allowed for this item will hardly procure a choke of such value. The Radio Corporation of America promises the amateurs special chokes for this purpose very soon. An open core choke that will operate very satisfactorily in this location can be made of core iron in a single leg 2 inches square in cross section, 10 inches long, with a winding space between heads of about 9½ inches. After insulating the core, wind on 5 lbs. of No. 26 B&S enameled wire, in smooth layers, inserting 3-mil craft paper or waxed paper between layers until the entire 5 lbs. has been used.

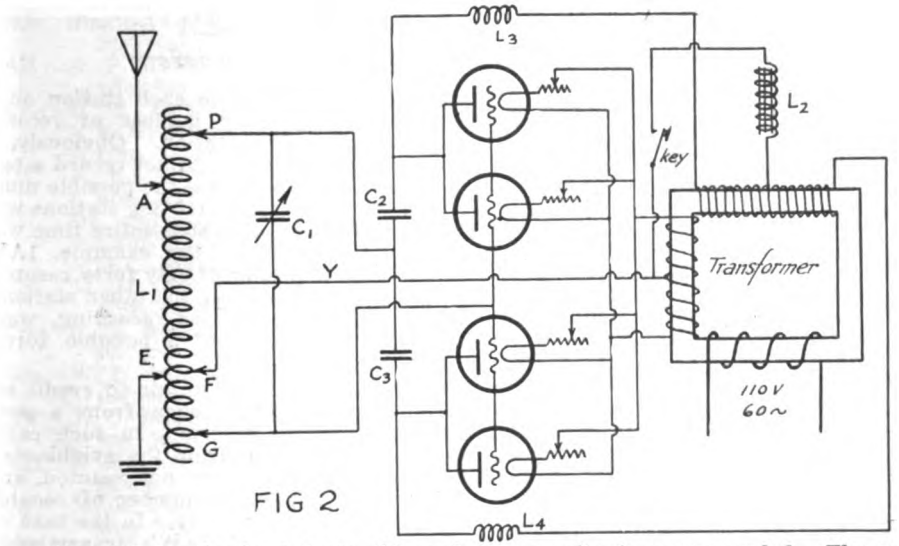


FIG 2

The Oscillating Circuit.

The circuit here shown is the Hartley, known by its users as a "sure-fire oscillator." L_1 may be any of the good C.W. inductances on the market; or homemade, such as 40 turns of No. 6 solid copper wire, small copper tubing, or edgewise-wound copper strip, about 6 inches diameter, and with turns as close as convenient. Five clips should be provided. The condenser C_1 is a concession to convenience—with exactly proper tuning it is unnecessary and its use causes a slight loss, but it is immensely convenient in tuning and its use at small values of capacity is recommended. The position of clip F determines the feed-back voltage to the grids, and is one of the major adjustments. The inductance between A and E determines the wave length, but with changes in the position of F both A and E should be shifted so as to keep E as close to F as possible, thereby maintaining the filament circuits at substantially ground potential.

The users of this circuit have found a grid condenser or C battery unnecessary, the circuit arrangement probably biasing the grid sufficiently. Should trouble be had on this account, a condenser and leak may be inserted in the grid lead.

The Hartley circuit of course is not the only one that can be used in this set. The same inductance L_1 and an oil-immersed variable will make possible the use of the well-known Colpitts circuit; leads P, F and G of this tube equipment being connected to the points customarily occupied by plate, filament and grid connections, respectively,

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in the Colpitts circuit.

It is almost unnecessary to add that meters to read current in the plate, filament and antenna circuits are the next thing to imperative for maximum results.

Telephony.

If a high-reactance choke is used at L_2, telephony may be employed with results as good as with D.C. supply. 8XK's phone is A.C., and his modulation is obtained by using additional tubes (of course arranged to use both sides of the cycle just like this oscillator) in parallel to the oscillating tubes, in the Heising "constant-current" circuit. With a condenser in the grid circuit of Fig. 2, grid-leak modulation may be used, or for experimental purposes a Ford coil may be used at Y in Fig. 2 after the manner suggested by Mr. F. S. Huddy in Fig. 2 of his article elsewhere in this issue.

Conclusion.

The foregoing embodies the latest data which QST has on simple Amateur C.W. The set described will work rings around a 1 k.w. spark set, and if the transformer is of sufficient output the power may be increased whenever desired by simply adding another tube on each side of the circuit.

Performance of January QSS Recorders

—1AW wins close decision over 1TS and 4EA in Prize Contest for January Fading Test Recorders—

THE Bureau of Standards, acting as judges in the contest for the cash prizes to the best recorders in the January Fading Tests, experienced no little difficulty in rendering a final decision upon the relative merits of so large a number of almost equally able A1 recorders. The contest was exceptionally close, and while the very creditable records of Mr. H. P. Maxim, 1AW, Hartford, Conn., were finally selected as deserving of first place they were nearly equalled by those of Mr. D. H. Mix, 1TS, Bristol, Conn., and Mr. A. W. Parker, 4EA, New Bern, N. C., who were chosen for second and third prizes respectively.

In the process of selecting the winners, the first problem to confront the judges was that of fixing some standard for the comparison of the records. To meet this need, the following method of grading was finally adopted, as being the most fair and impartial of any available plan.

Points Considered	Relative Weight In Per Cent
Number of records	50
Quality of records	35
Information on atmospheric conditions	10
Station description	05
Total	100

In using this system, which attaches such a relatively great importance to the number of records, it was soon found that all recorders credited with thirty or more records were distinctly eligible for first honors, and accordingly, the records of those falling into this class were carefully considered until the final decisions were reached.

In order to maintain a uniform practice in grading the number of records, it was necessary to grade each station on a basis of the possible number of records for that particular station. Obviously, a transmitting station could not record a test of its own sending; hence the possible number of records for transmitting stations was less than for stations whose entire time was devoted to receiving. For example, 1AW was graded on a basis of only forty records, while 4EA and most of the other stations, whose only function was recording, were graded on the basis of a possible forty-eight records.

It was also decided unfair to credit recorders with records taken from a very near transmitting station. In such cases the records received from the neighboring transmitting station were not counted, and the recorder's possible number of records was decreased accordingly. In the case of 1TS, the records of 1AW's transmission were not counted, and his possible number of records was reduced from forty-eight to forty. This also applied to 1NAQ 3ZE and others.

The general character of the records received for all the January Tests was exceptionally good. The following list of recorders who submitted over 30 records, with their respective ratings, will serve to illustrate the excellent quality of the work and the close nature of the contest.

Call	Name and Location	Group	No. Records (P.C.)	Grade (P.C.)
1AW	H. P. Maxim and L. A. Morrow Hartford, Conn.	A	83.3	82
1TS	D. H. Mix, Bristol, Conn.	A	77.0	81
4EA	A. W. Parker, New Bern, N. C.	B	83.3	80
8BQ	H. M. Walleze, Milton, Pa.	B	91.6	79

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8MT	R. M. Sincock and J. G. McKinley, Uniontown, Pa.....	A	77.0	79
8ML	F. M. Murphy, Cleveland, O.....	B	70.8	79
3ZE	H. A. Snow, Washington, D. C.....	B	68.8	78
8DT	F. J. DeMarest, Williamsport, Pa.....	A	81.3	76
8IK	K. G. Preston, Ashland, O.....	A	81.3	76
1AK	H. C. Bowen, Fall River, Mass.....	B	85.3	76
8EF	A. G. Heck, Manningtton, W. Va.....	B	81.3	76
1NAQ	J. C. Randall, Hartford, Conn.....	B	79.2	75
8ZD	B. P. Williams, Pittsburgh, Pa.....	A	73.0	75
9ME	Slagle and Kinney, Ft. Wayne, Ind...	A.	72.8	75
3AR	A. P. McDowell, Philadelphia, Pa.....	B	70.8	74
1CK	P. F. Robinson and F. M. Oliver, Braintree, Mass.....	A	64.5	72
8DV	J. E. Ahrend, Monaca, Pa.....	A	66.6	72
8ZL	Mr. and Mrs. Charles Candler, St. Mary's, O.....	A	81.3	72
2ZM	L. M. Spangenberg, Clifton, N. J.....	A	73.0	70
3CS	F. G. Raser, Trenton, N. J.....	A	68.8	70
3BD	W. L. Anspach, Philadelphia, Pa.....	A	62.5	70
8ZW	J. C. Strobel, Wheeling, W. Va.....	A	73.0	67
8VB	C. Mathews, Marlette, Mich.....	A	62.5	65
8ZF	M. H. Pancost, Lansing, Mich.....	B	66.6	64
5ZP	H. E. DeBen, New Orleans, La.....	A	66.6	62
9OX	C. F. Pflum, and J. A. Kolb, Louisville, Ky.....	A	66.6	62
8ACH	J. A. Victoreen, and P. A. Frantz, Cleveland, O.....	A	62.5	60
9FQ	L. Pfeiler, and G. Riddell, Sheboygan, Wisc.....	A	62.5	57
4AL	C. W. Clodfelter, Winston-Salem, N. C...	B	62.5	50

Failure of the Transatlantic Tests

AS our readers know, on February 1st, 3d and 5th some two dozen American stations transmitted prearranged signals which were listened for by a large number of British experimenters in the hope of getting across, with prizes offered by manufacturers on both sides for the best performance of their respective amateurs. The U. S. stations transmitting were 1HAA, 2RK, 2ZL, 1UD, 1DA, 1RU, 1XV, 1AW, 1AF, 9ET, 2ABR, 8AB, 2BK, 2DX, 1AK, 1RV, 2ABE, 3SM, 8XA, 2EB, 1GH, 1BBO, 1DB, 2QR, and 1BBK; while in the United Kingdom over 250 amateurs enrolled their names with Mr. Philip R. Coursey, B.Sc., organizer of that end of the tests, from which entrants some thirty logs of signals received were handed to "The Wireless World" for examination.

The arrangements on this side were in the hands of our Operating Department, at the request of Mr. M. B. Sleeper, originator of the plan, and arbitrary signals were assigned for transmission by various entrants. In England, then, a careful examination of the receiving logs against the confidential copy of the assigned signals would show who had been heard. After careful checking it can be said that not one entrant received a single word or signal which *unquestionably* can be attributed to an American amateur station. We are now in receipt of a letter from Mr. Coursey, amplifying upon his cablegram reporting the failure of the tests, and adding the information that in spite of the inability definitely to assign to American amateur sources any of the received signals, a number of their best equipped stations were able just to hear extremely faint C.W. signals on 200 meters which, however, were far too faint to be read for checking up with the schedules. These results were attained only by many stages of amplification, in many cases as many as eight or ten steps being used. With this super-amplification the British contestants had two big difficulties with which to contend: first, harmonics from commercial stations, which were of great bother; and, second, jamming from other entrants by radiation from their oscillating receiving valves. This is contrary to law in Great Britain, which we must remember is of very small area in comparison with our country—so much so that it has been found necessary to prescribe that all heterodyning shall be by a separate oscillator. On such high amplification it readily can be seen how the radiation of an autodyne receiver completely spoiled the reception for other amateurs in the vicinity.

Naturally we are disappointed in this outcome—the more so as American ex-amateurs have demonstrated that our amateur signals *do* get across all right, and that on an ordinary detector-two-step. Such reception is a new field for British experimenters and they hardly can be expected to show the same performance as an American dyed-in-the-wool ham who has learned how get amateur DX only after

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years of patient struggle. We have tested most of the circuits used by the Britishers, and find them one and all decidedly inferior to our standard American regenerative circuit using variometer tuning in secondary and tertiary circuits. We would bet our new spring hat that if a good U.S. amateur with such a set and an Armstrong Super could be sent to England, reception of U.S. amateurs would straightway become commonplace.

We do not mean to deprecate the loyal co-operation shown by our English confreres, however. For the admirably complete way in which they go into a problem we have the greatest respect, and we are most sincerely grateful for their interest and enthusiastic co-operation in this, our first attempt to get overseas on schedule. We will all hope for better luck next time.

Amateur Radio Recovers a Stolen Auto

IN November of last year QST pointed out editorially the splendid service that Citizen Wireless could be to the community in aiding in the recovery of stolen automobiles, and urged A.R.R.L. members to see what co-operative movements could be put into effect in their territories. We have since recounted the work that has been started and described how, in New York City, our editorial was the means by which Sergeant Chas. E. Pearce, in charge of the New York Police Station, KUVS, succeeded after several years of effort in getting the permission of his department to institute the service in New York City. KUVS has broadcasted descriptions of stolen cars nightly at 7:30 and 11:30 on 400 meters, and the information is copied by amateurs in nearby cities and turned over to their police departments.

Now we have the news that a recovery has been made by Amateur Wireless, and credit for the first instance of this kind from New York City goes to Messrs. Richard Frank and Wm. Michel, of Union Hill, N. J., operating station 2TK. KUVS on March 21st included in its broadcast "Alarm No. 1668—Two ton auto truck, painted green; marked on both sides 'Gillen Bros., 34 Twelfth St., Brooklyn'; 97 boxes oranges." This was picked up by Frank and Michel and given to their police. The Union Hill detective force were instructed immediately and within a very few hours the car was discovered in a garage in that city, and New York police advised accordingly. Our congratulations to 2TK.

Other police departments are showing much interest in the New York experiments and officials in many of the smaller towns around the big city are arranging with local amateurs to pick up the broadcasts for them. Jersey City will soon begin work on a police radio station of its own, and other municipalities have the matter under consideration. Meanwhile KUVS continues its broadcasts, and amateurs who have not already reported receiving same will confer a favor on Sergeant Pearce if they will send him a postal acknowledgment, care Police Radio, 240 Center St., as the department desires information on the range of the station.

Transcon Dope

THE following additions to the story of the Transcons have developed since our article in March QST:

Transcon 14 msg. nr. 3 was reported as terminating at 1DY at 2 a.m. Jan. 15th. 1DY passed the message on to 1MD, Dorchester, a spark coil station by the way, who made the final delivery about 2:10.

We originally reported Transcon 16 reply nr. 1 as being hung up at 1JBT, Dorchester, Mass. So it was, for that "night", but the next morning 1JBT gave it to 1FU, also Dorchester, to QSR, and it seems it did go on to some other station past 1FU.

Transcon 15 Special, from Maxim to Bessey, reported at 6JT at 4:20 a.m. but apparently getting no further. 6AE, Stanford University, Calif., advises us that immediately after 6JT got the message from the east he started it to him (6AE), 6ZK being on 375 at that time. QRM was so bad that it took half an hour to get it OK at 6AE, after which time 6ZK could not be raised and had apparently turned in. So, even if it never reached its scheduled destination it got thru to the west coast and to within 15 miles of. 6ZK.

The Washington's Birthday Relay

THE free-for-all relay that was held on February 22d under the management of W. H. Kirwan, Old Man Ex-9XE of Davenport, Iowa, with the co-operation of the A.R.R.L. Operating Department personnel, was a big success in spite of perfectly rotten weather in many parts of the country. It will be remembered that the idea was for every interested amateur, wherever he might live, to pick up the various sections of the message coming thru the air from different parts of the country, piece them together, and deliver to the highest municipal official in his town, get a receipt, and report to Davenport. Some splendid time records were made and concrete evi-

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dence afforded once more that Citizen Radio can broadcast information and get it over the entire country in remarkably little time. The completed message was from President Warren G. Harding, in an open greeting to the American people, and read as follows:

"May the spirit of Washington be our guide in all national aspirations and may the current year mark the return of tranquility, stability, confidence and progress for the entire year."

A good many hundred dollars' worth of apparatus was donated by our liberal-hearted manufacturers to be awarded to the receiving stations who made the best showing, taking into consideration the distances and difficulties over which the reception had to take place, etc. Our cordial thanks are due Mr. Kirwan for his successful management of the affair; those who have had anything to do with running a relay will appreciate the amount of time, patience, labor, and even money which such effort costs, and for which the sole compensation is the knowledge of having done something constructive for the game we all love. Several hundred amateurs filed their reports with Mr. Kirwan and from them he has prepared a table of performance, showing the percentages achieved out of a theoretical maximum, and from this the judges, Messrs. Edwin H. Armstrong and Hiram Percy Maxim, with Dr. A. N. Goldsmith acting as referee, are choosing the prize winners. The decisions will be announced in an early issue of QST.

The prizes to be awarded, and their donors, are as follows:

A. W. Hallbauer, 1001 N. Lockwood Ave., Chicago, Ill.
1—Pair Lattice Variometers.
Radio Distributing Co., Newark, N. J.
1—Radisco—Vario Coupler.
Clapp-Eastham Co., Cambridge, Mass.
1—Type Z.R.F. Regenerative Receiver.
Chicago Radio Lab., Chicago, Ill.
1—Zenith Regenerator.
Tresco, Davenport, Iowa.
1—Hook'er to Yer Bulb—20,000 meter C. W. tuner.
Eugene T. Turney Lab., Radio Hill, Holmes, N. Y.
1—Spider Web Unit complete.
Coto Coil Co., Providence, R. I.
1—Complete set of Honeycomb Radio Inductance coils.
C. D. Tuska Co., Hartford, Conn.
1—Type 181 Inductance—see their catalog.
1—Type 182 Inductance—see their catalog.
A. H. Grebe & Co., Richmond Hill, N. Y.
1—CR-8A Receiver.
General Radio Co., Cambridge, Mass.
1—One step audion amplifier that sells for $28.00.
Montgomery Ward Co., Chicago and Kansas City.
1—Two step amplifier—this is a beauty, boys.
Signal Elec. Mfg. Co., Menominee, Mich.
1—R37 Tuner—listing at $37.50.
Electrical Specialty Co., Columbus, Ohio.
1—New design Regenerative Receiver—selling for about $50.00.
Federal Telefone & Telegraph Co., Buffalo, N. Y.
1—New type—260 W.—Microfone for Radiofone.
John Firth Co., Inc., New York, N. Y.
1—No. 0-3 Midget Advance Eldrege Meter.
2—No. 0-1 Model H Eldrege Meters, H. W.
2—No. 0-5 Model H Eldrege Meters, H. W.
5—Pairs Brownlie adj. Wireless fones.
C. Brandes, Inc., New York, N. Y.
1—Pair of the new Navy type Wireless fone receivers, 50,000 ohm A/C impedance.
W. J. Murdock Co., Chelsea, Mass.
1—Pair of their well known No. 55 wireless fones, 2,000 ohms.
Sears-Roebuck Co., Chicago, Ill.
1—Large tuner, Navy type.
Illinois Watch Co., Springfield, Ill.
1—Illinois watch.
Shotton Radio Co., Scranton, Pa.
1—Schramco Oscillation Trans. with shielded clips.
Atlantic Radio Co., Boston, Mass.
1—C. E. Antenna Switch.
Klaus Radio Co., Eureka, Ill.
1—of their Radio Storage batteries.
Thordarson Elec. Mfg. Co., Chicago, Ill.
1—Type R/S ¼-KVA Transformer.
Acme Apparatus Co., Cambridge, Mass.
1—Acme 200 Watt C. W. mounted transformer.
Chelsea Radio Co., Chelsea, Mass.
1—No. 3 Condenser with Bakelite Dial.
1—No. 21 Variable Grid Leak.
1—No. 41 Bakelite Dial and Knob.
Connecticut Tel. & Elec. Co., Meriden, Conn.
2—Connecticut Variable Condensers.
Karlowa Radio Co., Rock Island, Ill.
1—C. W. 20 B. Enclosed Rotary Gap.
Wireless Mfg. Co., Canton, Ohio.
Choice of N. S. R. 300 Rotary Gap or N. S. R. 600 Rotary Gap.
The Wilcox Laboratories, Lansing, Mich.
1—No. 14A Rotary Gap.
E. T. Cunningham, Audiotron Mfg. Co., San Francisco, Cal.
1—C-301 Detector.
1—C-301 Amplifier.
Radio Corporation of America, New York.
6—U. V.-200 Radiotrons.
6—U. V.-201 Radiotrons.
QST, Hartford, Conn.
5—Yearly subscriptions.
Radio News, New York.
5—Yearly subscriptions.
Pacific Radio News, San Francisco, Cal.
10—Yearly subscriptions.
Radio Topics, Chicago, Ill.
1—2-Year subscription.
Amrad—American Radio & Research Corp., New York, N. Y.
1—$50.00 coupon for your pick from their catalog of apparatus to this amount.

A Novel Method of Measuring Distributed Capacity

HIGH distributed capacity in coils is to be avoided as it decreases the tuning range considerably and induces high resistance effects at resonant frequency. The last year has seen great improvement in coil design, so that coils with much lower capacity are available to the amateur. Most of the methods of measuring distributed capacity are dependent on the use of complicated formulae, or require precision instruments not ordinarily available to the amateur.

The following is a simple, accurate method of making this measurement, and requires only simple apparatus:

1. Measure, or determine the natural period of the coil. This is best accomplished by using an oscillator.

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2 Shunt the coil with a calibrated variable capacity, and adjust until the natural period of wavelength is double.

3. Read the capacity value of the shunt variable.

4. Divide this reading by three to obtain the distributed capacity in microfarads.

Example: The natural period of a coil was found to be 100 meters. The capacity value of the shunt variable to make the natural period 200 meters was .00015 mf. This divided by 3 equals .00005 mf, the distributed capacity of the coil. The explanation of this is that the wavelength varies as the square root of the capacity. Therefore, to double the wavelength, we must increase the capacity four times. Calling the unknown distributed capacity C_1, and the calibrated shunt variable capacity C_2, then

$$C_1 + C_2 = 4C_1$$

Substituting, $C_1 + .00015 = 4C_1$

$$.00015 = 3C_1$$

$$C_1 = \frac{.00015}{3} = .00005 \text{ mf}$$

—Contributed by William F. Diehl, 2CY.

March Station Reports

1HAA, Marion, Mass.

Steadiest	Loudest
1DY—1AW—1GBT	1EAV—1AW—1YB
2RK—2JU—2ZC	2RK—2ZC—2JU
3HJ—3DH—3PU	3HJ—3DH—3PU
4YE—4AT	4YE—4AT
8HP—8ZW—8AMZ	8HJ—8AMZ—8XU
9ZN—9CA—9FN	9ZN—9OC—9CA

1DY, Lynn, Mass.

Steadiest	Loudest
1HAA—1YB	1HAA—1YB
2RK—2JU—2OM	2RK—2JU—2EL
3GO—3DH	3GO—3DH
8XE—8HP	8XE—8ZR

1CK, Braintree, Mass.

Steadiest	Loudest
1HAA—1DAC—1YB	1HAA—1YB—1BM
2RK—2JU—2EL	2RK—2JU—2EL
3DH—3GO—3BG	3GO—3DH—3BG
4BY	4BY
8AGK—8XE—8ZE	8XE—8AGK—8HP
9UH—9JJ—9LQ	9ZN—9UH—9UU

2RK, Brooklyn, N. Y.

Steadiest	Loudest
1HAA—1AW—1OE	1HAA—1AW—1OE
3GO—3HJ—3XF	3GO—3HJ—3XF
4XC—4AG—4BY	4XC—4AG—4BY
5XA—5YH—5ZA	5XA—5YH—5ZA
8ZL—8AIO—8ML	8ZL—8AIO—8ML
9ZN—9ZL—9ZJ	9ZJ—9ZN—9ZL

3BZ, Danville, Va.

Steadiest	Loudest
1AW—1HAA—1GCB	1AW—1HAA—1GCB
2RK—2DA—2JU	2RK—2DA—2JU
3GO—3HJ—3HG	3GO—3HJ—3HG
4YB—4XC—4BY	4XC—4YB—4BY
5DA—5ER—5YH	5DA
8ZE—8ZL—8WY	8ZE—8ZL—8WY
9LQ—9ZJ—9UU	9LQ—9ZJ—9UU

3EM, Baltimore, Md.

Steadiest	Loudest
1AW—1TS—1OE—1GBT	1AW—1HAA—1BBL
2RK—2JU—2TF—2EL	2RK—2JU—2EL
3NB—3DH—3HJ—3GO	
3EN—3ALN	3NB—3DH—3GO
4AC—4AG—4YB	4AG
5DA—5ER—5YH	5DA
8ZL—8XU—8ZW	8ZW
9ZL—9ZN	9ZL

4XC, Atlanta, Ga.

Steadiest	Loudest
Nil	1AW—1HAA—1RAY
2RK—2EL—2BK	2EL—2RK—2BK
3HJ—3DH—3EN	3GO—3EN—3HJ
4AG—4GN—4FD	4BY—4FD—4GN
5YH—5YE—5JD	5YE—5YH—5JD
8ZL—8DC—8ZY	8DC—8HG—8ZL
9AAC—9UH—9UU	9ZJ—9AAC—9YI

4YA, Atlanta, Ga.

Steadiest	Loudest
2RK—2EL	2EL—2RK
3GO—3EN—3YK	3YK—3GO—3EN
4AG—4FD—4GN	4AG—4FD—4GN
5YH—5XA—5IF	5YH—5XA—5HW
8ZL—8DC—8ZL	8ZW—8DC—8ZY
9LQ—9AAC—9LR	9ZJ—9OX—9LQ

7CC, Moscow, Idaho.

Steadiest	Loudest
6ZR—6QR—6EJ	6ZR—6QR—6EJ
9YW	9YW—9WU—9AGN

7ZG, Bear Creek, Mont.

Steadiest	Loudest
5ZA—5XB—5XD	5ZA—5XB—5XD
6ZM—6IG—6ZA	6ZM—6IG—6JT
7YA—7CC—7IN	7YA—7BQ—7CC
8ZR	8ZR
9WU—9YW—9LR	9WU—9YW—9ZN

7BK, Seattle.

Steadiest	Loudest
6EJ—6AK—6OH	6ZR—6EJ—6AK
7CW—7IN—7CC	7BP—7BQ—7IN

8SP, Fairmont, W. Va.

Steadiest	Loudest
1HAA—1AW—1XT	1HAA—1AW—1BBL
2RK—2EL—2JU	2RK—2JU—2EL
3BZ—3EN—3GO	3DH—3GO—3EN
4YB—4FD—4XC	4YB—4XC—4FD
5DA—5YH	5DA—5YH
8ZL—8RQ—8WY	8QJ—8ZL—8FT
9UU—9ZN—9JN	9ZN—9UU—9JN

9DU, Dubuque, Ia.

Steadiest	Loudest
5YH—5LR—5ZA	5BR—5YH—5HL
8ZW—8ZV—8OJ	8ZW—8ZL—8OJ
9YI—9OE—9LR	9YO—9YI—9OE

9AHZ, Kansas City.

Steadiest	Loudest
5YH—5HL—5LO	5HL—5YH—5ZA
8QJ—8TT—8ZL	8QJ—8TT—8ZL
9JN—9OE—9YA	9JN—9OE—9YI

9LR, Anthony, Kansas.

Steadiest	Loudest
2RK—2JU—2ZL	2RK—2ZL—2JU
3DH—3VV—3EN	3DH—3EN—3VV
4XC—4AG—4XB	4XC—4XB—4AG
5ZA—5ZAB—5LR	5XB—5LR—5ZAB
6IG—6JD—6ZN	6IG—6JD—6ZH
7ZG—7KX—7YA	7ZG—7KX—7EX
8ZY—8ID—8ZL	8ZY—8ZL—8KP
9AEG—9EQ—9WU	9YI—9ZJ—9LA

9YB, Lafayette Ind.

Most Consistent	Loudest
None	2RK
3DH—3YK	3DH—3NB—3YK
	4YB—4AL—4DJ

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5YH—5DA—5YE	5DA—5YH—5YE
8ZY—8ZA—8ZD	8ZY—8ZR—8ZA
9ZJ—9LQ—9QO	9ZJ—9ZQ—9LQ

Remarks:

First District. No change. Few stations heard.

Second District. 2RK much best, no others are good.

Third District. 3DH still in lead. 3NB very QSA once or twice. A newcomer 3YK with a peculiar tone seems to work through all kinds of QRM and QRN.

Fourth District. All stations seem to have dropped off from the earth. Only a few stations heard and very irregularly.

Fifth District. Same stations doing the work. 5DA roars in like a local station.

Sixth and Seventh Districts. No stations heard.

Eighth District. Toss up between many good stations. 8ZY seems to have a slight lead this month with 8ZA, 8ZD, 8ZR and 8XE pressing closely for the honors.

Ninth District. 9ZJ still the station heard loudest but is not working very often. 9LQ still the station heard most often of any in the call book. 9OE and 9QO among the regulars and 9YA, 9YW, 9YY, 9ZC and 9ZQ among the specials seem to be in the air regularly.

The Resonant Converter

By Walter S. Lemmon

Presented before the Radio Club of America, Columbia University, Nov. 26, 1920.

THE many advantages accruing from the use of high musical tones in radio transmitters of both spark and C.W. types has led to the development of a simple and effective means of producing them.

The Resonant Converter is applicable in its present development to both types of apparatus and therefore may be particularly interesting to amateurs at this time. Before describing the device in detail it may be well to state that it has been used by the writer for many years during its development, both at his own amateur station and at others'.

No attempt will be made in this paper to outline the complete development of the device but some of the fundamental features will be given of the practical apparatus already produced. Essentially the Resonant Converter was developed as a simple means of converting direct current into alternating current of any desired frequency. In practice this alternating current may be applied in the transformer of a spark set or to the plates of vacuum tubes.

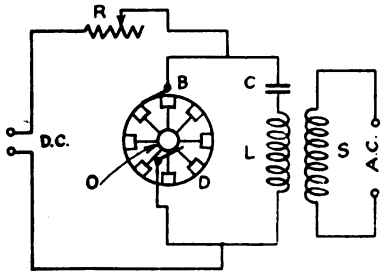


FIG. 1

The component parts of the fundamental circuit are illustrated in Fig. 1. Here D represents a revolving disc or controller containing alternate conducting and insulating segments which for the purpose of illustration may be assumed of equal length. A brush B and a collector ring O lead the current through the disc. The disc controls the admission of energy from the D. C. source to the resonant circuit LC. The speed of the disc is adjusted so that the number of makes or breaks per second is equal to the natural frequency of LC. (a complete cycle being produced by a complete make or break.) In order to control the energy admitted to the device and also prevent short circuiting the line, a control resistance R is inserted in the supply lead. Inasmuch as R is non-inductive it does not alter the tuning conditions of the resonant circuit.

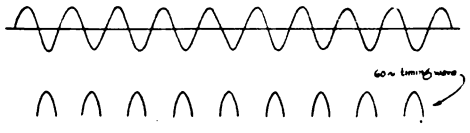


FIG. 2 - RESONANT CONVERTER - OUTPUT CURRENT WAVE SHAPE
OUTPUT AT RESONANT SPEED

The wave shape of the current produced by the machine when operating at resonance is shown in the oscillogram, Fig 2. This oscillogram was taken with the machine adjusted to give 60 cycles and it will be noted that the wave shape is remarkably sinusoidal. With resonant adjustment any sparking at the controller practically disappears. This adjustment, moreover, is not critical but the driving motor speed can be varied over quite a range before sparking becomes objectionable. While not attempting to dwell too much on theory in this paper, the action of the Resonant Converter may be roughly described as follows: During the period of break, the resonant circuit is charged from the supply line and then during the closing of this contact the energy in LC is discharged at the same time period. The current upon discharge acts oppositely to the line current so that the break is accomplished at a point of minimum current flow

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—hence no sparking. Due to the opposite direction of charge and discharge, and the regular repetition of this action, an alternating potential of pure wave shape is produced at the terminals of the transformer.

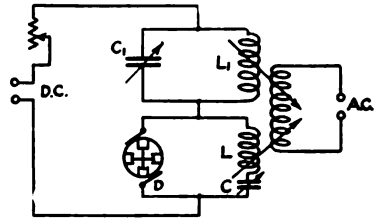


FIG. 3

If instead of supplying the resonant converter with direct current, an alternating current is employed, it is possible to multiply the frequency of the source. For instance, from 60 cycles a 500 cycle tone may be obtained. This effect will be treated more fully later in the paper.

Now instead of using the resistance, R of Fig. 1, to control the power supplied, an effective resistance may be composed of the parallel inductance and capacity L_1C_1 as in Fig. 3. When this circuit is tuned in a similar manner to LC it has the current limiting effect of a resistance,

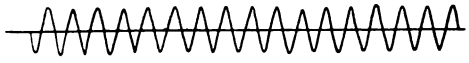


FIG. 4 - RESONANT CONVERTER - OUTPUT CURRENT ABOVE RESONANT SPEED RANGE

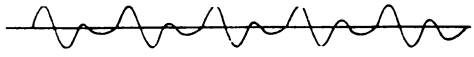


FIG. 5 - RESONANT CONVERTER - OUTPUT CURRENT BELOW RESONANT SPEED RANGE

without seriously altering the other operating qualities of the machine. As a further refinement it was found that there was a circulating current in the parallel circuit, L_1C_1. Therefore this circuit could be coupled to LC, thereby amplifying the output by a sort of regenerative action. In some experiments it was found that this amplification increased the output about 20%.

It may be interesting at this point to note that when the machine is operated above or below synchronous or resonant speed, we no longer have a sine wave output but the distorted waves of Fig. 4 and 5 respectively. When the Resonant Converter is operated from an A.C. source the resulting spark note is not exactly a pure tone but carries a 60 cycle undertone, which however gives a resultant tone readily distinguishable through static. By adjustment of the various circuits, however, the quality of the musical tone can be varied at will, and with certain refinements the lower frequency can be eliminated.

The Resonant Converter as a spark transmitter is shown in Fig. 6. Here the primary of the transformer is formed by the inductance L inserted in the resonant circuit. The condenser C is made variable in steps, which for low power transmitters may be several 2 mfd. telephone condensers (tested for 1000 volts.) The resonant control circuit L_1C_1 may be formed of a similar set of condensers, and L_1 made either a part of the primary winding or a separate inductance. A small resistance R is inserted in the supply lead to vary the power.

While the transmitter will operate very satisfactorily with a quenched gap, it is

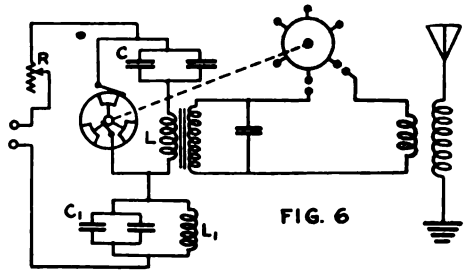


FIG. 6

ideally suited for the use of a synchronous gap. The synchronous gap is mounted directly on the driving motor shaft and since the position of maximum voltage is readily found the gap functions very smoothly. Inasmuch as the resonant converter gives one alternation at make and another at break, the gap should contain a number of studs equal to twice the number of conducting segments on the controller disc.

A photograph of a model transmitter

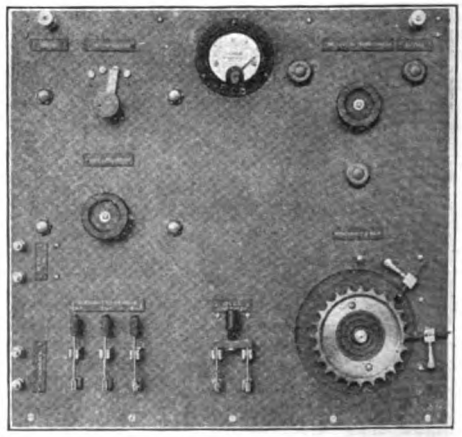


Fig. 7

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built along these lines is shown in Fig. 7. The set is designed for 200 watts and is of the panel type. A pure musical spark tone can be obtained at any desired frequency from 300 to 500 cycles. The set operates from 110 volt D.C. and is simple and easy to operate, requiring but few adjustments.

Among the various applications of the Resonant Converter principle, perhaps the most interesting one at this time is that of a plate voltage generator for V.T. sets. Its inexpensive contruction and steady operation makes it particularly desirable for amateur low power work where a 500 cycle alternator or high voltage D.C. generator is not readily obtainable. Since the Resonant Converter gives a pure tone readily adjustable from 200 to 500 cycles it may be directly employed for modulated C.W. telegraphy or used with a suitable filter for telephony.

In Fig. 8 the use of the Resonant Converter is illustrated, together with a double self-rectifying circuit. The converter produces directly at its terminals 1000 volts at a frequency adjustable from 200 and 500 cycles. Taps may be provided on the transformer secondary to obtain other voltages for tube operation. In case only one tube is used the entire output of the transformer may be directly applied to its plate.

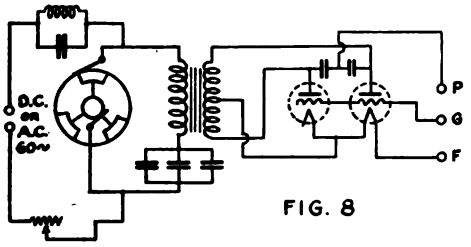


FIG. 8

Using the model shown in Fig. 9 a plate voltage of approximately 800 volts and a space current of 120 mils has been obtained from a 100 volt D.C. supply. This has been found sufficient to operate several 5 watt tubes in parallel. By using an A.C. supply and an A.C. driving motor (preferably synchronous) a clear tone closely resembling the old "Cape Cod" note can be produced. This tone has excellent carrying properties made famous by old "WCC" in the days of long distance spark press. When using the Resonant Converter on A.C. cycle supply, the tube filamaents may be lighted from the supply line by

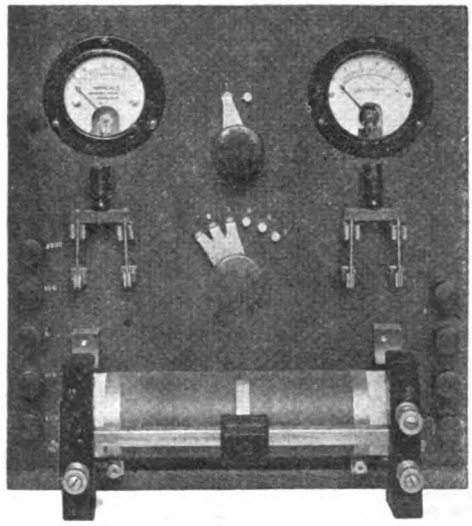


Fig. 9

a small transformer. There are of course many other arrangements of the Resonant Converter circuits of which space does not permit the description.

In conclusion, it is believed that the development of the Armstrong superheterodyne receiver will work hand in hand with a device such as the Resonant Converter for vacuum tube transmitters. This receiver of high amplification reproduces the exact tone of the distant transmitter and the great value of a distinctive tone is not lost by heterodyning. In traffic work over congested areas, which is the case with amateur or short range ship operation, constant and easily distinguishable tones are a great advantage. It is here that the adjustable frequency and wave-shape of the Resonant Converter may be found of greatest value.

C. W. for the Amateur

By Franklin S. Huddy, 1ll

THERE is no doubt that C.W. is the coming thing in the amateur world. It fills every need as regards the law, and, when considered as a whole, is a great deal cheaper and more satisfactory than the spark system. The number of C.W. stations going at this time is truly amazing, and the work that they do is even more so. Thanks to a well known concern, a very practical little power tube has been put on the market at a very low price. This is the greatest boost that amateur C.W. has had for a long while. The thought of paying some hundreds of dollars for a high power tube has kept many away from this new art.

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When you have mentally digested the above, and are convinced that it is true, you will want a C.W. set, let us hope. Then you think of the maze of complicated hook-ups and the quantities of apparatus that you must have, and it seems hopeless. I think that the following will help make matters clear. There are several hook-ups adapted to every kind of situation. Surely one of them will be right for you.

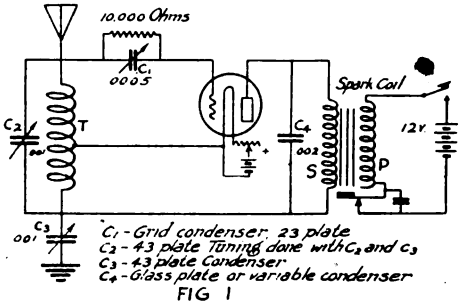


FIG 1

Here is scheme number one. It is I.C.W. and cannot be used for phone work. The source of high potential is our old friend the time-honored "squeak-box." This little system works very well indeed and is worth trying, (Fig. 1). The inductance is made as follows: Twenty five turns of insulated wire of any size between 12 and 20. B. & S. wound on a tube 5¼ inches in diameter. Such a tube may be obtained from a package of "Quaker White Rolled Oats." The tap "T" is at the 16th turn from the bottom.

The circuit in Fig. 1 is a very good oscillator for use on a small antenna. Even with a fairly large one, a 200 meter wave may be obtained with C_3. If a source of D C. is used for the filament, it should be

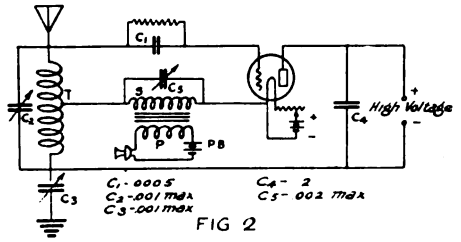


FIG 2

connected as shown, but A.C. from a step-down transformer may be used with equally good results. A set like this using one Radiotron UV202 on a good antenna will put into the antenna 500 M.A.'s or higher if the tube be "crowded" a little. The grid leak is very important and **must** be carefully adjusted. A resistance of around 10,000 ohms is correct, altho it varies with every tube.

Scheme number two. Figure 2 shows the same circuit used as a phone. The constants are the same as in Fig. 1. In this circuit a D.C. must be used on the filament for best results. The battery "PB" will vary according to the type of transmitter used, but a regular Western Electric transmitter takes about 18 volts.

There is no need of buying an expensive modulation transformer. A Ford coil is very nearly as good in this circuit as any on the market and is preferable for two reasons. First; there is a very high voltage-amplification which is necessary in this circuit or in any circuit employing grid modulation. Secondly; the low resistance primary permits use of a smaller microphone battery with consequent lessened heating. The vibrator should be firmly short-circuited. The condenser across the secondary must be of at least .002.

Scheme number three. Figure 3 shows a circuit for a more advanced radio-phone. It is very stable, easy to adjust and very efficient. The inductance "L_1" is wound on a tube 5¼ inches in diameter: 60 turns of number 14 D C.C. magnet wire tapped

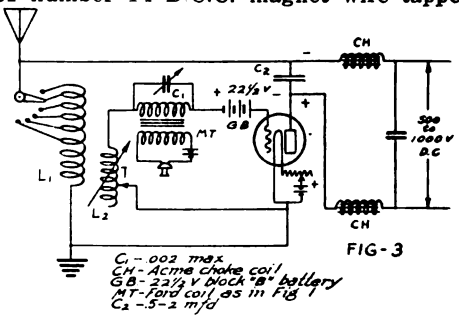


FIG-3

every fifth turn for thirty turns. The coil should be impregnated with a good insulating varnish, and, if possible, baked to exclude any trace of moisture. Tickler "T" is of 50 turns No. 18, tube 5 inches in diameter, tapped every 5 turns, and slips inside of "L_1".

Altho these sets are very simple, real results may be had from them, and the writer hopes they will be of help to other amateurs in getting a C.W. set on the air.



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The Chicago Plan*

By R. H. G. Mathews, Central Division Manager

The admirable organization of the Chicago District is becoming known the country over and the plan has been applied with success in many other communities. In this paper Mr. Mathews describes the system in detail in a manner that will serve as a guide to its inauguration elsewhere. We commend these principles to A.R.R.L. men everywhere.—Editor.

IN a large city the population is always divided into sectional groups, each comprising individuals of differing racial characteristics, habits and inclinations. Even though America is a "melting pot," its heat is not always sufficient to blend together in one harmonious mixture the acid, oil and water of the temperaments of the various nationalities comprising the population of our large cities.

Single large radio clubs have always signally failed to secure perfect cooperation between the various groups and cliques of radio men found in our large communities, partly for the reason just mentioned, and partly because of perfectly natural sectional rivalry. If properly directed, this rivalry can become helpful and constructive competition.

In Chicago before the war several attempts were made to consolidate the several conflicting groups, which, because of local conditions resolved themselves into north, south and west side "gangs," each having as a primary object the annihilation of the aerials of the others. Frankly, Chicago conditions before the war were the worst that the writer has ever seen anywhere. We can recall vividly the time when old 9IK was to participate in one of Kirwan's Washington's Birthday Relays and the entire aerial was forcibly and thoroughly removed thirty minutes before the scheduled time. Another antenna was hurriedly built which served the purpose and the relay went through but in order to keep this one from following the first, two friends sat out under the mast with 38 calibre "cannons," and chased away exactly eight individuals, each with his little side-cutting pliers.

If this condition had continued Chicago would have been the dead spot in regard to relay traffic that several other large cities are at the present time. Fortunately, however, there were in each of the already existing sectional "clubs" certain individuals having influence and with an unselfish consideration for the radio game as a whole. The writer and Mr. F. H. Schnell, then Chicago City Manager, called together these men and the Chicago situation was discussed. As a result, the method of organization now known as the "Chicago Plan" was evolved.

By this plan Chicago radio matters are regulated and administered by an Executive Radio Council composed of the officers of each club affiliated with the council. All such clubs must be already affiliated with the A.R.R.L. before application for affiliation with the Chicago Executive Council is considered. At the present time the clubs comprising the Council consist of five in the city of Chicago, one in Indiana just south of Chicago, one in Elmhurst, just west of Chicago, and one in Milwaukee, north of Chicago. As each club becomes affiliated its officers automatically become members of the council which is presided over by the Chicago City Manager, appointed by the Central Division Manager. An elected chairman of the council is not desirable since better cooperation with the League is secured by making this office one of appointment rather than election.

In order to control interference it has been found desirable not only to admit already existing clubs but in cases where there is territory where no clubs exist, but because of the number of radiomen in such territories the need of a radio club is felt, the Council of its own volition sends out organizers for the purpose of forming an organization which will be affiliated with the council in due course.

Being composed of elected officers from all parts of the city, the Chicago council is a really representative body and this fact has added to the respect with which it is regarded by Chicago radio men. Traffic regulations adopted by such a body must of necessity be fair to all interests and accordingly little trouble is found in enforcing such rulings. No attempt is made by the Council to interfere in any way with the individual activities of the various affiliated clubs but the best of cooperation between them is secured through the friendly personal contact of the officers. Through regulation the dues and fees of all clubs are the same. Any radio man may belong to one or more of the clubs as desired, and meeting dates are arranged so that they do not conflict. The average active membership of each of the Chicago clubs is approximately 100,

*A paper presented before the Third District Convention at Philadelphia, Feb. 26, 1921.

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making a total active membership for the city of 500. In order to keep this great number of men interested, the clubs pay considerable attention to the social and fraternal side of club life. We have found that in a radio club paying attention to technical matters only, the interest soon dies in the great mass of members and accordingly the Chicago clubs run raffles, dances, theater parties, etc., and have baseball, football and basketball teams, competing with each other under the guidance of the Executive Council. All our efforts have been toward creating better friendly feeling and cooperation among the mass of Chicago radio men. In order to gain their cooperation we must have their active memberships in the various clubs and to get this we must make the clubs so attractive that membership is a privilege rather than a duty. On this rests the structure of our Executive Council. Without the firm foundation of willing and interested cooperation with the individual clubs an Executive Council is without prestige and authority.

After all, the biggest moral force in the world is that of public opinion, and on this fact the Chicago Plan is based. In order to maintain this prestige, club members will not carry on radio communication with outsiders and every effort is made on the part of club officers to set forth the advantages of membership to newcomers in the radio game. Individual attention is given every radio man who is not a club member and as a result there are **no** "outlaws" in Chicago.

A set of traffic regulations has been drawn up by the Council as follows:

Sec. 1. There shall be four divisions of operating hours as follows: 6 a.m. to 7 p.m.; 7 p.m. to 10 p.m; 10 p.m. to 11:30 p.m.; 11:30 p.m. to 6 a.m.

Sec. 2. Between the hours of 6 a.m. and 7 p.m. stations may test, tune, transmit either locally or long distance without interruption.

Sec. 3. Between the hours of 7 p.m. and 10 p m. stations may transmit **locally only.**

Sec. 4. Between the hours of 10 and 11:30 p.m. transmission can be made only to long distance stations. Stations not having regular traffic to clear should use this period. Those working between these hours cannot during the next period; see section 5.

Sec. 5. Between the hours of 11:30 p.m. and 6 a.m. transmission can be made only to long distance stations. Those having worked during the previous long distance period (Sec. 4) cannot transmit during this division.

Sec. 6. All stations within the jurisdiction of the Council shall use the minimum amount of power necessary to carry on their communication.

Sec. 7. All official Traffic Officers may communicate with each other at any time to assist in carrying out their work. They should be brief.

Sec. 8. At no time shall any unauthorized person assume the duties of a Traffic Officer unless given such authority by the City Manager.

Sec. 9. Stations commencing operation after any extended absence shall be permitted, after asking "QRW?" to call "CQ" three times followed by his call three times in order to ascertain whether any long-distance is waiting for him. The abbreviation "QRU?" may also be used.

Sec. 10. All radiophones and CW sets are considered as radio transmitters and come under these regulations at all times.

Sec. 11. All stations desiring QSP tests will use the following form only: Call the station once, signal QSP, sign own call once.

Sec. 12. All stations within the jurisdiction of the Council shall be considered as local to each other.

Sec. 13. Any irregularities of the above regulations shall be promptly reported to the local Traffic Manager who will report same to the City Manager so that action can be taken on each side, thereby stopping the trouble at once.

Sec. 14. The Traffic Officers shall be the only ones permitted to send out local "QST's" for the City of Chicago.

Sec. 15. Traffic Officers shall use the personal sign "TO"; their assistants, "TR."

Note:— No station should dispute an order given him by a Traffic Officer, over the radio. If there is any misunderstanding or question, use the wire telephone or make your written report to the City Manager.

It will be noted that the evening is divided into three periods, one for local and two for long distance work. Originally it was thought that there were but two classes of radio amateurs, local and long distance, but a trial showed that there is a third class of operators doing long distance work but not interested in mes-

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sage traffic. These operators wished to carry on conversations, test their sets and experiment and resented the "hogging" of the air for long periods by the stations handling message work. I believe this fact is the rock on which many a good set of traffic regulations has split up. By establishing **two** long periods, the first for work other than traffic and the second for traffic only, and providing that no station may work **both** periods but may choose which he prefers on any one night, all friction between traffic men and experimenters is eliminated.

The Chicago traffic regulations are enforced by the City Manager and a corps of assistants. These assistants are elected, three by each club, to stand watch in order, and each one has authority over members of his own club only. However, a log of **all** violators is kept by each traffic officers and these logs are turned over to the City Manager weekly. The City Manager separates these violations and turns them over to the proper club, also weekly. The officers of the clubs investigate each case and decide whether the violation was caused by ignorance, malicious action, etc., and report to this effect on every case to the City Manager. The City Manager, in turn, presents these cases, as soon as reported back, to the Executive Council which places a fine for each offense, not on the offender **but on the club to which he belongs**, or, if he is not a club member, on the club in whose territory he is located. It is then up to the club to collect the fine from the individual if it can, and to see to it that further violations do not occur. In this way the Council has an organization to hold responsible for every violation and in addition, since the fines come out of the club treasuries, every club member feels a very personal interest in the violators, since the theater parties, etc., can only be run when there is money in the treasuries to run them. If 99 men feel that one other man is keeping them from having a good time by his persistent "ignorance" they are certainly going to assist personally in his rapid and forcible education. Another example of the force of public opinion properly harnessed and applied.

As a matter of fact, this plan has worked so well that very few fines have been necessary. Cards are mailed by the Traffic Officers to each violator when the violation is logged, these cards naming date, time and nature of the violation and requesting the violator to get in touch with his club president at once regrding the violation. This prevents the violator from protesting that he was never given notice of his wrong action and "knew nothing about it," and also has an excellent psychological effect. I have known of instances when all the traffic men were on the job and each violator received 15 cards on the subject.

Traffic officers never argue over the air. If a violation occurs within the territory of any traffic officer, he calls the violator by radio, and merely states that he has violated a certain rule, naming it, and asks him to stop. If the violator is disposed to argue, the traffic man does not reply by radio but calls him by telephone at once. A complete list of all Chicago calls is furnished the traffic officers by the local Radio Inspector as fast as they are issued and these calls are listed with phone numbers by each Traffic Officer. Calling by phone also has a good effect in that the ringing of the phone generally wakes the violator's family and he gets a paternal "razzing" in addition to the one administered by the traffic man.

Seriously, however, the traffic officers are required to be very careful and diplomatic in their work and every attempt is made to secure the cooperation of persistent offendrs by friendly methods and these usually win out.

In addition to the Traffic Officers, the Council has a "direction finder squad" supplied with a car, equipped with a loop, regenerative receiver and three-step amplifier.

This squad exists for the purpose of locating unlicensed or "mysterious" stations and cooperates with the radio inspector in every possible way.

The Chicago traffic rules are very carefully observed by all traffic men and can only be set aside by direct order of the City Manager or the Central Division Manager for some special reason of extreme importance. In this way criticism of the various traffic officers is avoided.

Our attempt has been, first, to draw up rules fair to the little fellow as well as the big one, and to have these rules drawn up in such a way and by such a representative body that the little fellow **knows** they are fair; second, to administer these regulations in an absolutely fair and straightforward manner, and in such a way that everyone **knows** the administration is fair; and, third, to secure compliance with the regulations by tactics of friendly cooperation and the force of public opinion rather than by individual threats or action. These methods combined with the loyal mutual cooperation of our big fraternal radio "club-families" have converted Chicago from a radio-Bolshevist community to what I now believe it to be, the best big radio city in the United States, and to prove this I ask you to note how few repeats Chicago long distance stations request because of "local QRM."

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The CQ Hound

By 7KX

HERE is an epistle that I have been trying to get off my heaving chest for the past thousand years. Who is not familiar with the CQ hound? I can not think of what specie to call him, maybe a Dachshund, as he sure is longer one way than the other when it comes to polluting the sacred ether with his long pleading wails for some other ham which he hopes to be at least fifty thousand miles away to come back at him "vy QSA OM". I am stuck away out here amid coyotes, cowpunchers and sage brush, not all because I want to be but because my nose led me here. Then being a pre-war ham I had to put up a set to listen to the quality of the post-war sigs Oh man, it sounded good to hear the old gang again and all went well until the newness of the game wore off again and I settled down to do some real receiving. Then it was that the CQ hound began to burn my ears like the hot solder burnt my face when I was trying to solder the aerial to the sky hooks. Men, I have stood it as long as I can and now to relieve some smouldering gun play that is sure to come off I must hasten this rattle eastward to the QST factory.

When it reaches the aforementioned place it will probably find its rightful place, the waste basket, but if it ever gets into print among the sacred pages of our good old QST let some of the newer of our set soak it in. Then when they go to bed that night let them ponder over it a while and before the sand man puts their lights out for the night, swear that they will never holler CQ again, and if the temptation is so awfully great, not to squeal it more than three times and then sign off and QUIT.

The climax came the night of the Washington's Birthday Relay (in capitals, men, as it made history) and as my chest was heaving so high that night as to break over the sea wall, I couldn't refrain any longer. I put the fones on at 6:10 P.M. M.T., the time here that the msg was to start from our far famed 1AW, the start of the Eastern half. That these CQ hounds were on the job was at once noticeable. I didn't lay the fones on the table until 10:22 P.M. when I received the complete msg, and during that time I added the blackest page to my call book that the history of my radio play has ever brought forth. If I could put that page into print many of the CQ-slinging hams would see their calls listed as outlaws in the amateur game. Two stations who are in the state where many good amateurs reside, the state where the Dalton Bros. robbed the coffee store, the state where the sun-flowers wither in the hot sun in the summer time, are among the most prominent of the black page outlaws. They kept the ether so fluttered up with QRM that any non-suspecting novice who might have happened to be listening in with the "Town Ham" couldn't help but say "who is that making all that noise?" During the time that one of our good stations in this same state was doing all his Benwood and Dubilier would do for him, trying to get the first words of the west half of the msg to the Windy City, these other birds were chirping off at "bug" speed, jamming all who were straining every nerve in their bean to get the first whimper of the west half of the msg. One of these stations was listed in a recent issue of QST as reaching out and he is, but why in the name of amateur radio does his call have to clutter up my black list as a bad actor? I am out here on what you might call the jumping off place as traffic here at times bumps up against a wall of QSS till working is nil. I have only one bulb but, man, it gets more CQ's into my fones than it does intelligent sigs. My sympathy goes out to the fellows that live right among the CQ hollering, the "legislation agitating" hams, and if we could peek into the radio shack of some of these old timers we would certainly find a book lying around handy in which there would be at least one black page. A lot of us could cast our glimmers over that page and find our calls listed there with the rest of the outlaws of amateur radio.

We talk about the so-called little fellow with the spark coil, we have words at him, put him in print as the real outlaw of the radio game and have branded him with the skull and cross bones. But mark my word, these "little" fellows will have a seat in the place we all want to go to and there won't be one single CQ hound there to bother him with their plea "how do you receive me?" I have heard a few of our good stations crying CQ but always followed with east, west, north or south msg. letting us know he has a msg. for some one in that direction. Here is where the CQ helps our game, but the bird that hollers it to see how many cards or letters he can get is the one this trash is directed at.

We hear you, CQ hounds. Open your dreamy eyes and look at the calls heard in QST and see how far you are getting, but on bended knees, CQ hounds, please put that call where the Allies put the

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EDITORIALS
de AMERICAN RADIO RELAY LEAGUE



Another Poindexter Bill.

ON Tuesday, April 12th Senator Poindexter reintroduced his radio bill in the new Senate and it now has a new number—S-31. At this writing our Legislative Committee has not yet secured a copy of the bill to examine it but it is suspected that it is the same document that was before the last Congress under the number S-4038. Newspaper clippings just before us today indicate that still another bill has been introduced in the House, by Representative White of Maine, and it seems that it must follow somewhat the same lines as Senator Poindexter's bill except that the committee of representatives of various radio interests is to be an advisory body in Representative White's bill, whereas S-4038 would have empowered it with the formation of all the technical regulations governing radio in this country.

Eternal vigilance seems to be the price of safety in any field where there are so many different interests, more especially in such a one as ours. It looks, fellows, as tho if it isn't one radio bill it's another! These bills have just been introduced and as yet we don't know what they are, but if Mr. Poindexter's is the same as his 4038 it must be opposed. Certain interests in the east who would seem to have something to gain by the passage of such a bill have recently given much publicity to a letter signed by the then acting secretary of the Navy stating that it will be the policy of his department to further in every way practicable the interests of the amateurs and that the Navy will advocate the freest practicable development of amateur activity. We earnestly hope for the establishment of cordial relations with the Navy Department, yet Senator Poindexter's S-4038 was patterned on a draft gotten up by naval officials and it was *not* the kind of a bill we could support, for it would give control of all radio into the hands of a committee over which the navy would have the balance of power and would give no assurances of fair dealing with us amateurs. The Navy Department and Senator Poindexter must realize that American Citizen Radio will not be content with legislation that, instead of definitely allotting certain fields to amateur work, arbitrarily gives over its destiny to the hands of "a little group of willful men" who are answerable to nobody and from whose decisions there can be no appeal.

Use Your Wave Meter!

WAKE up, fellows, and find out what your wave length is! Buy or borrow a wave meter and take some readings, and if she reads above 200, by the Lord Harry cut 'er down!

We are insistent on this subject the last few months because we know there is sure trouble ahead if the situation isn't remedied. There are thousands upon thousands more amaturs than ever before in the history of the art and the chances for infringing upon the rights of other interests when we begin to overstep our bounds are just that much greater. The other night we heard three naval stations pipe down four different amateurs for QRM. No doubt part of this trouble was due to the way the average naval operator tunes a set, but it is likewise probable that the amateurs in question exceeded the legal 200 meters or they would not have been the only ones picked upon. All this stuff gets written down in government logs, you know, and when there becomes too much of it, thru our ever-increasing numbers, the fur will surely fly. If you get your license revoked because you operate above 200 meters will you expect the A.R.R.L. to help you? N.D., O.M.—we can't support a violator of the law. You're having your chance right now—mark our words: it will pay you to stop operating until you get your station in conformity with its license as regards decrement, power, and more particularly wave length.

Help us in "the return to normalcy"—USE your wave meter! In turn we're going to help *you*. Our Operating Department is appointing listening-in stations who are going to give the Traffic Manager lists of stations heard on waves above 200. Those of you who are reported are going to get a nice letter telling you just what your wave is and asking you to help preserve Amateur Radio by getting down where you belong. Of course this will be

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a strictly intra-organization matter, and its sole object is to help us better ourselves. Saw off work long enough to retune that station of yours so a report on you won't be coming in here to Headquarters.

Our Bonds.

AS we write this our Treasurer's office is busy making out checks and our Secretary's office is busy making out envelopes to mail those checks, to reimburse the good amateurs who two years ago lent their A.R.R.L. the hard coin to purchase QST and resume the publication of the little magazine we all love so much.

Our bank balance when we get thru is going to be as low as a sixty-cycle growl, but just the same we're going to do it. We'll be cramped financially for quite a while, as it's taking every penny we can rake and scrape, but the bonds *shall* be paid, and *will* be by the time this QST is mailed. And we'll get by, and gradually as we accumulate a little reserve we'll be freer to undertake new work.

One of the things we want to do first is to publish a real textbook on radio; a book different from any other now in existence, dealing with the basic theory of amateur radio in a way that will give every amateur operator a clear theoretical understanding of how his apparatus functions so that he may experiment intelligently and not haphazardly; and a book that will likewise serve as a text for the non-technically trained individuals who in increasing numbers are taking up the study of Citizen Wireless.

The CQ Party

SOMETIME in listening in on a particularly good night it has seemed to us as if all the amateurs of the country were transmitting at once. But now we know we were wrong. In the CQ Party only one district transmitted at a time, but man, dear, did you ever hear anything like it? Such QRMMM surely was never heard before and we hope it never will be again. We suppose O.M. Baldwin will be busy the next two years replacing cracked micas from that one half-hour's foolishness.

The party seems to have been enjoyed universally, and there were almost as many "Hi's" floating around as there were "CQ's", showing that most of the gang appreciated the spirit of the thing. Lots of new records undoubtedly were made. 9ZN, we know, copied a flock of 4's that never had been heard there before; and so it went. A number of Canadians were heard all over the eastern and central states. 9ZN sent out its first and last CQ that evening. 8KK wins the handsome single-slide tuner for having crammed more CQ's into his three minutes than anyone else, ripping them out at lightning speed with a bug key. But wouldn't it have been wonderful if all of these birds had stayed on schedule? Why did a few stations have to work clear thru the party? Don't they ever read QST? (But, say, gang, can you imagine the sensations of the benighted brethren who hadn't read QST and who all by chance got an earful of our party? They must have thought it unwontedly queer that so many stations were simultaneously indicating their willingness to chew the rag with anybody so inclined!)

But the CQ Party wasn't intended altogether for diversion. It had a serious purpose—to show up the foolishness of the unholy amount of CQ-ing that has gone on every night all over the country, causing untold interference that is so unnecessary. Persistent CQ-ing is nothing less than a bad habit, accomplishes nothing good whatever, and merely breaks up communication in nearby states. Relay stations know with whom they are supposed to work in handling traffic without having to sear the heavens with a CQ in order to pick up enough business to get fun out of the game. We refer, of course, to operation in DX relay hours; if during "conversation" hours one wants to CQ, it's excusable if he doesn't know a soul to call by call-letters. But for the love of Mhy. let's keep CQ out of relay hours.

THE CQ HOUND

(*Concluded from page 26*)

Kaiser. I beg you to do this, and "I" means the whole A.R.R.L. and if you satisfy my wondering whims by doing so you will satisfy about as many other hams as you have hair on your old CQ hollering pate. I have a sneaking idea that this will start a rumpus that will be harder to stop than it was to stop Daniels from trying to get our game under the old sea dogs, but I have it off my chest and am ready, bulb lit, fones on and aerial switch in, ready for all the nice language you want to throw at me. If you can't get at this QRM problem by pleading like good men do we will have to hit you with a little hot stuff and then see if you can pipe down for at least a couple of hours in the night. I am out here where I can take to the mountains if you come after me but remember I will take a portable set with me and after your attack has subsided I will come back at you with a CQ story that will burn worse than this one.

So-long, CQ hounds, never to CUL.

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The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



IN spite of the coming of QRN our reported messages reached a total of 8840 for the month of March.

The New England Division lays claim to the individual honor position this month when "Amateur Number One" rushes to the front with this report:

MR. I. VERMILYA, 1HAA
Marion, Mass.
608 messages.
New England Division

This is the greatest number of messages yet credited to a single station in any one month, and we congratulate Mr. Vermilya, not only for his remarkable piece of work, but also for *reporting* it in time. Many of our members handle more than a hundred messages each month but fail to report them. Help your division, fellows, and send in a report of your work on time.

Southern Stations.

Our persistent efforts to work thru to Florida have borne fruit. Traffic is now moving from 4YA, Atlanta, to 4FD in Midville, Ga., and 4BY in Savannah, Ga. These stations QSR to 4DL, 4AM, and 4BI. While this route is only fairly consistent, improvements will be made. QRN in that part of the country is the greatest handicap with which southern amateurs have to contend right now.

C.W.

Perhaps the scarcity in reports this month is due to the fact that many spark stations are being dismantled in favor of the onrushing C.W.—our members are too busy making the change to spare the time for writing reports. We hope this assumption is true, as next month we will be in the midst of the QRN season and C.W. will be our only means of reliable communication over great distances. C.W. station owners are requested to communicate with their Division Managers for appointments on the C.W. routes which will be in operation next fall. We want C.W. transcontinental routes open for traffic just as soon as stations are available.

Reports this month are missing from the following divisions: Delta, J. M. Clayton, Mgr.; Central, R. H. G. Mathews, Mgr.; Rocky Mountain, M. S. Andelin, Mgr.; and St. Lawrence, A. J. Lorimer, Mgr. The other reports follow:

CENTRAL DIVISION.
Ralph Mathews, Mgr.

No detailed report received.

Total messages 1710. Busiest station 9YAD—143 messages.

ATLANTIC DIVISION.
C. H. Stewart, Mgr.

Just at the present time this Division is undergoing a state of reorganization, with the result that reports are lacking. It is hoped that the changes recently made in personnel will result in improved conditions in the future, both as regards monthly reports and other traffic matters.

Mr. John DiBlasi, owing to pressure of his own business matters, has resigned as A.D.M. Northern Section, and the Division was fortunate in finding a successor who we have every reason to believe will make good as soon as he has had time to acquaint himself with the traffic affairs of the Northern Section. Mr. Clifford J. Goette, (2JU), 1624 Hamilton Avenue, Woodhaven, L. I., N. Y., has been appointed A.D.M. for the Northern Section, which comprises the States of New York and New Jersey. As Mr. Goette's appointment was only made on the 18th of March it was obviously impossible for him to acquaint himself with the affairs of the Section in time to make a report this month, but we will expect a good report from him for the coming month. There are some remarkably good stations in this Section and there is no reason why with proper co-operation the best of operating results should not be achieved, and the Division Manager earnestly hopes that he can count upon the best of co-operation with Mr. Goette from all amateurs located therein.

Mr. E. B. Duvall, who was recently appointed A.D.M. in charge of the Southern Section, which comprises the States of Penna., Delaware, Maryland and the District of Columbia, has appointed Mr. George L. Deichmann, Jr., (3HG), Park Heights & Bancroft Park, Baltimore, Md., D.S. for Eastern Maryland, and Mr. Roger

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W. Clipp, (3ABC), 112 Broadway, Hagerstown, Md., as D.S. for Western Maryland. These appointments have been approved by the Division Manager. Both of these gentlemen are well known in their sections and in outlying territory, owing to the DX work they have carried on. The Division Manager is particularly glad to know that the League will be properly represented in the Western part of Maryland, as he has desired to see the development of the projected Southern route of Trunk Line B, through southern Pennsylvania and western Maryland either to Washington, Pa., or Pittsburgh and other western points.

Attention is invited to the creditable work accomplished by the station of Mr. J. K. Hewitt—2RK. It has been brought to my attention that an operator on a transatlantic vessel, enroute New York to London, reported that he heard the signals of 2RK QSA and steady every night. On the eastbound trip this operator copied many amateurs up to 1730 miles from N. Y. but lost all but 2RK on the next night approaching London. Receiver used on vessel was a Navy SE 143 and SE 1000 amplifier. English ships also heard signals of 2RK while inside of Gibraltar, a distance of over 3000 miles. This station has also been reported consistently by coastwise steamers running in the Gulf of Mexico, and has actually worked 37 states and has been heard in 40 states. Mr. Hewitt believes these results to be a world's record, and in any event it shows what may be accomplished by careful and painstaking attention to details. There is no particular reason why such performances cannot be duplicated by other stations in the Division, and we expect to hear of this being a fact in the near future. (2RK handles hundred of messages each month, but Gawdnose, he does not report them as he should.—Tfc. Mgr.)

The Benzee Bros., Acting D.S., Western New York, reported in the latter part of January that the relay work in their section was going along nicely, and that a total of 176 messages had been handled as follows: Buffalo—8SL, 2; 8LB, 21; 8MF, 1; 8KU, 3; 8FE, 24;—Lockport—8IL, 14; 8AHV, 7;—Rochester—8GI, 38; 8AMQ, 14;—Oakfield—8AMZ, 32. They report that 8MF and 8AD are again working. The Radio Association of Western New York has been affiliated and every member is working for the betterment of radio and the prompt handling of traffic. Tests have been under way with Erie and Toronto, but have not been successful. Mr. R. D. Haire, 8GI, of Rochester, has been appointed City Manager for that place, with the object in view of getting the local organization to control QRM which has been hindering the advancement of radio there. Benzee Bros. call attention to the fact that at present there are no routes running into the southern and southwestern part of N.Y. State, and they would be very much pleased to hear from stations in the vicinity of Jamestown, Olean, Dunkirk and Syracuse. Benzee Bros.' address is 196 Keystone Street, Buffalo, N. Y.

Mr. Harry S. Collins, D.S. Northern Section of Long Island, Babylon, N. Y., also reported late in January that the station of Mr. Tremaine Hulse, of Bay Shore (2BGR) will be on the job every night between 9:30 and 10. At present he states that the best route through his section is via 2JU, 2ZL, 2OE, 2FS, 2AJW and 2BCR then across the Sound to 1HO, 1FW,1HAA, etc. 2BGR and 1HO have a regular schedule. Some spark coil QRM is being experienced, but much QRM is also being had from WSE and NDD.

In the Southern Section Mr. Duvall, the A.D.M., states that some of the D.S. are slow to send in their reports. D.S. Central Penna., Mr. H. M. Walleze, reports that 3ABD of Danville, Pa. is doing fine work. Station 8XE at State College has been active, but QRN has been bad the past month. 8XE does not seem to be able to work Pittsburgh in a satisfactory manner. During the past month 63 messages were handled by this station. Mr. Walleze states that 8BQ has not been changed to 8AJB, but that this call has been assigned to a portable set.

D.S. Eastern Pensylvania, Mr. S. W. Place, reports that due to the fact that the antenna and mast of his station 3BH were recently wrecked by a storm he has been unable to keep in touch with the activities of his section or handle any traffic. His A.T.M., Mr. R. C. Ehrhardt, of Dunmore, Pa. reports that 8ACS of Scranton, Pa., is getting lined up for DX work.

Mr. Duvall, who was still acting D.S. Eastern Maryland Dist. during the past month, reports stations 3HG, 3AHK, 3UC, 3OU and 3EQ doing good work handling traffic through Baltimore. 3HG and 3AHK seem to be running a race in the matter of handling traffic. 3EQ is reaching out with a C.W. set and when some further improvements are made it is believed that it can be counted upon as a reliable DX station. The latter named station is operated by J. Q. A. Holloway and C. E. King. The station of the A.D.M., 3EM, has been in operation for some time, but so far no DX work has been done, his station principally being used for control work in Baltimore. The station of 3AN, Yearly, which has been out of commission during the present season, will soon be in operation again, as his wrecked mast has been re-erected, and he has also added to his equipment a CR-3 and 2 step amplifier.

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Doubtless Yearly will soon win back his laurels as one of the most reliable stations in Baltimore. While no reports have been received from the Dist. of Columbia, the A.D.M. states that he is personally aware that the stations in that section are very much alive, and that 3XF, 3IW, 3KM and 3ALN are consistently heard, and that a fairly reliable schedule has been arranged and is in operation between Baltimore and Washington. Conditions between Philadelphia and Baltimore are reported still unsatisfactory. Perhaps by means of C.W. this section will be bridged before long. There are a number of stations working on C.W. sets in Philadelphia, and as soon as it is felt to be practicable stations of the same class should arrange for tests and schedules with similar stations in Baltimore.

What was without doubt the most successful Convention yet held by amateur radio men was that which was promoted and managed by the Second District Radio Council. This Convention was held in New York at the Hotel Pennsylvania during the four days of March 16, 17, 18 and 19, the affair ending up with a Banquet in the Ball Room on Saturday night at which nearly 600 radio enthusiasts were present, including a number from distant points. It was well worth while to attend, and the Division Manager felt much pride in the knowledge that the radio enthusiasts of Northern Section of his Division were able to carry out their plans in such a successful manner. The exhibits of Radio apparatus in the Roof Garden made it well worth while to attend, if for no other reason, although the pleasure of meeting so many of his fellow amateurs was the most attractive feature of it all. To Mr. J. O. Smith and the other members of the Committee of which he was Chairman much credit is due for the hard work done, and the nerve required to carry it out upon the large scale attended. It was a great thing for amateur radio in that section.

NEW ENGLAND DIVISION.
G. R. Entwistle, Mgr.

A.D.M. Robinson, (1CK) reports that the air is full of C.W. now-a-days and anyone with a bulb receiver can get in on this and the best part of it is that you are just as likely to hear a DX station as a local, more so in fact, because there are more DX-C.W. sets than local.

A very noticeable piece of real citizen radio was heard on March 4th at 2:20 a.m. when 1HAA shot fourteen messages to 1TS without stoping, with a bug key at the rate of about thirty words per minute, and at the end of it all Mix came back with a laconic "dit dah dit".

1HAA handled 608 messages during the period between Feb. 20th and March 20th. 1DY handled 160 messages, 1CY 240; 1CK has been too busy to get in on the DX stuff lately and only handled 100 messages.

Johnson (1DY) of Lynn, has been doing fine work in his district, but does not receive reports from the relay men as desired.

A.D.M. D. H. Mix, (1TS) reports that 1AW has been on but two or three nights during the past month and this accounts for some of the decrease in activity. 1NAQ has just put in a C.W. set and putting out 1 amp. 1TS handled a total of 77 msgs. during the past month.

D.S. H. E. Nichols, reports 1BM handled 58 msgs. and 1HO handled 79 msgs.

A.D.M. H. W. Castner (1UQ) reports that 1RAY is doing some fine work. They are in communication with many Canadian stations and aside from some local induction that bothers at Burlington, they can work many of them. Bowdoin College (1NBJ) is now operating and in Portland 1FV, 1RAS, and 1UQ are on most of the time. 1VY and 1UL in Bath are on most of the time but beyond that in the other cities of the state, there are no stations that are able to handle relay traffic at present.

Portland has formed a C.W. Club.

Let us try to get the reports in on time instead of none at all as in the past.

Total msgs., 1322.

Busiest station 1HAA—I. Vermilya, Marion, Mass., 608 messages.

ROANOKE DIVISION.
W. T. Gravely, Mgr.

Old Man Static has been on the job incessantly during the past month, with only an open night here and there. This has caused a slowing up in traffic throughout the Division but even under this handicap a number of messages have been handled. However, as the warm weather approaches there will be less and less activity, unless stations link up so as to make daylight operation practical. This can be done, but it means efficient plants at distances not exceeding 100 miles, and before this Division can hope to cover the territory, considerable work must be done. We have strong hopes of developing a day route from northern West Virginia on down into Roanoke, Va., and thence on down to Charlotte, N. C., through Lynchburg, Danville, Winston, Salisbury, and Greensboro, with an alternative of Winston or Greensboro.

Operations will continue all summer. There is no "next season" any more, and if conclusive proof is desired on this subject, just keep your ears to the phones, and there will be surprises. Especially will the C.W's. shine during the warm months, but the old familiar sparks may be heard, too.

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Every D.S. is requested to bend his efforts towards creating day lines, so come on, fellows, and let's put the job across.

Mr. Wohlford D.S. S/W Va. is still trying to work out a route to the West, through Bristol, and intermediate points; also a reliable line up through West Virginia, in conjunction with Dist. Supt. Heck who is still hammering away on the West Virginia situation.

8SP is still doing the "star" work in Northern W. Va., and is clearing a considerable amount of traffic.

D.S. Bunker of North Carolina, with the assistance of Mr. Gluck, is clearing up the North Carolina situation. There are three good stations at Winston, N. C., all capable of clearing considerable traffic, 4AL, 4CK, and 4CX. 4CC at Greensboro promises to take hold in the near future.

Mr. Blair, 3ZL, D.S. Central Virginia, reports great activity in their radio club and a membership of 85. He also introduces this month Mr. R. R. Chappell, 3ZP, who will assist him in the handling of Richmond Traffic. 3ZP will use C.W.

Mr. Blair reports about 30 stations operating in Richmond now, which number includes spark coils and other types.

Mr. T. C. White, Jr., C.M., Norfolk District, reports his vicinity has been seriously handicapped since last report by the terrific static almost every evening after dark.

Messrs. Hopkins and Buskey of 3GO have handled a good part of the traffic, having three operators, and maintaining a watch every evening.

Sgt. Blair of XF-1 at Langley Field deserves a great deal of credit for his assistance in clearing traffic North and West. Sgt. Blair is looking for a good C.W. station south so that he may clear his southern traffic in the same easy manner in which he clears North and West. (Southern stations please note, and write Sgt. R. H. Blair, Radio Headquarters, Langley Field, Hampton, Va.)

Sgt. Blair works Washington and New York in the day, with ease.

The C.M's. station, 3EN, has handled quite a number of DX messages since last report. His spark has been reported QSA in Tela Harbor, Honduras, by an operator on one of the Tropical Radio Telegraph Co's. ships. His greatest desire, at present, is to find a daylight route to Danville and Washington, also South, in order to clear in the day those messages which are hung up at night. Mr. White has established day communication with Elizabeth City, N. C., 4EY.

No change in the QRM from NAM's arc set and three spark sets.

Total mesages, 275.

EAST GULF DIVISION.
E. H. Merritt, Mgr.

About half of March was 'spoiled' for radio work in this Division by very heavy QRN of regular mid-summer intensity that kept us from doing as much work as was expected. 4XC experimented with an underground aerial and by using it had more success handling traffic than any other station reporting.

4XB has been doing fine work with C.W. 4YA has been giving concerts twice a week but power is small and they have not yet been reported over 50 miles.

Supt. Gulledge (4ZN, ex-4AT) reports that he expects to be connected with Key West soon. THE ROUTE TO FLORIDA IS AT LAST A REALITY, traffic going thru 4FD and 4GN easily. Both are in Midville, Ga.

Supt. McIlvaine reports nothing new in Alabama during the past month.

4AG has been testing with 4YA and 5XA but has been unable to connect with 5XA. There is at last good connection between 4YA and 4AG (50 miles) with 4YA using 250 and 700 meters. 4YA would like to arrange for tests with other stations to listen for the long wave. A radiofone set was mounted on a truck and started in the direction of 4AG during the month to try to get a line on the QSS and other peculiar conditions between the two stations but all attempts were 'busted' by severe QRN from storm clouds. Connection was made with 4YA up to about 30 miles but 4AG never did get any sigs. More of these tests are being planned later on and 4FD is planning a similiar test between his station and Savannah.

4XC reports 88 messages for the month and 4YA reports 26 for about ten days operation. Total messages 114. 4FD reports 22 msgs. to be added to the Feb. report. Only two stations reported for March. Let's hear from the East Gulf men on this each month.

DAKOTA DIVISION.
Boyd Phelps, Mgr.

In spite of the apparent early coming of summer the message total for the month of March is larger than for any previous month. There are still many stations that do not send in a monthly report of their total messages sent and received. We should receive credit for the work we are doing so please, everyone, send in your report in time to reach your District Superintendent by the 20th of each month, or if delayed after this date mail it direct to the Division Manager.

Mr. Harold Larson, 9KG, has been so busy with business that he has been unable to devote the necessary time to the District

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of South Dakota. Because of his love for the A.R.R.L. he has resigned in favor of Mr. N. H. Jensen, who has shown his ability as City Manager of Sioux Falls and will undoubtedly push South Dakota to the front. Mr. N. H. Jensen, Box 894, Sioux Falls, has been appointed District Superintendent and has prepared and mailed a circular letter to every amateur in the state that he knows of in the effort to organize branch and summer routes in his district. Mr. Charles Norton, 9AIF, 521 West 11th St., has been appointed City Manager of Sioux Falls. Mr. Norton and Mr. Jensen have done much to make the local Y.M.C.A. club (affiliated) one of the liveliest and peppiest in this Division by staging contests and events of all sorts.

D.S. E. S. Leavenworth, 9WU, Ellendale, N. D., has been spending most of his time moving traffic over the Northern Route in a most commendable fashion. Station owners to the west and northwest of him should write him and find out his plans for the branch and summer routes now being laid out. Mr. Chas. D. Curtis, 9YAF, at Pembina, N. D., has been working with Winnipeg stations 4AU and 4BG at 5 P.M. every afternoon and at the same time with 9AGN at Fargo and 9ZC at Baudette, Minn.

Mr. J. A. Gjelhaug, 9ZC, Baudette, Minn., has been corresponding, visiting and working with the Winnipeg fellows, getting them enthused over A.R.R.L. traffic. In Duluth and Superior, according to latest reports, there has been a rapid spread of the disease called "CWitis" and spark sets are being sold by the pound. We will have Mr. Bridges, 9DBT (ex "BQ") at Superior to handle traffic for the Twin Ports.

In the District of Southern Minnesota 9XI has handled the most traffic but during the previous months 9HM has been in the lead. Of the 193 messages handled at 9XI 60 per cent were on C.W. Mr. C. M. Jansky in charge of the University station has computed curves showing the percentage of calls completed on C.W. and spark and curves showing the reliability of each during varying periods of static based on the log of 9XI. Mr. H. R. Hall, 23 Merriam Place, St. Paul, Minn., has prepared a circular letter in the form of a questionnaire that he has been mailing to stations he hears in sourthern Minnesota. 9AMH at Northfield is regularly worked in daylight by 9XI and 9ZT.

Several good summer routes are in view, the best of which will be from the Twin Cities to North Dakota via 9SV, 9ABB, 9RJ, and 9LW. From 9LW at Wahpeton, N. D., the prospects look fair for a route west to Bismark but from there west to the 7th district the scarcity of stations makes it doubtful. A good summer route can be maintained from 9LW north via 9AEJ, 9AGN, 9YAF, to 4BG. Also south from 9LW there a good chance for a route to Sioux Falls, S. D. The places where stations are sorely needed are in the western part of North Dakota, central part of South Dakota, northern Minnesota especially between St. Cloud and Duluth, and in the southern part of Minnesota south of Northfield. The Division Manager would like to hear from anyone that has or knows of any stations in the above mentioned territories.

Total messages 1262. Busiest station 9WU—225 msgs.—E. S. Leavenworth, Ellendale, N. D.

MIDWEST DIVISION.
L. A. Benson, Mgr.

The Division Manager requests that all stations in the Mid-West Division operating C.W. communicate with him at once regarding a proposed C.W. route through the respective territories. This route will do away with the interference now experienced by spark stations throughout the Division.

9HT reports that many stations in and about Omaha are considering the installation of C.W. equipment. 9APA of Omaha has started his installation. Anderson, 9EW has been operating at 9HT during the past month. Tests are being conducted to determine upon the best method of handling traffic during the coming season. The following DX Omaha stations will alternate in carrying traffic, 9HT, 9SC, 9EW, 9DIT, 9VE. Local QRM problems are being handled by the Aksarben Radio Club of Omaha. 9EL reports that he is sending circular letters throughout his territory to gather information regarding day-light routes through Kansas. In addition to the circular letters he is getting in touch with all district Superintendents of bordering states for connecting routes in all directions, so that throughout the summer months traffic can be handled in short jumps.

Stations that are doing excellent work in Kansas are 9SZ, 9OE, 9PS, 9ALG, 9LB, 9AQE, 9AIZ, 9ALU, and 9AZB. The following appointments have been made in Kansas. 9AEG., Ira Graham, Eldorado, Kansas, second assistant district superintendent; 9OE, Paul Willis, Wichita (Kansas) city manager. 9HI, Bert Von-Wolf, Topeka (Kansas) city manager. 9JA of Iowa reports the following stations doing excellent work in handling traffic: 9MS, 9IY, 9JL, 9DBS, 9AMU, 9YA, 9DAU, 9OA. 9DBS located in the western part of Iowa forms a long-needed link in the Western line. 9AEQ, 9JN and 9ZQ continue to work DX. All stations in Iowa are to report to 9JA regarding the number of messages handled and also signals

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heard. The North route to the coast is working to perfection. The short jump route to Chicago and around East never fails. It runs from the central part of the state to stations 9YI, 9JN, 9JA, 9JL, 9YA and 9MS.

9DU of Independence, Mo., reports that daylight routes through the state of Missouri are working to perfection. He reports two new stations in Kansas City who are working on schedule from noon to 2:33 P.M. the latter clearing to 9QO, 9EX, 9FL, 9AAG, 9MW, and 9YN. 9XAB of Kansas City will prove a very valuable relay station. 9LR proves to be the main linking station between this territory and the west coast.

Total number of messages handled, 3,120.

WEST GULF DIVISION.
R. L. White, Asst. Divn. Mgr.

D. S. Dill reports: "Traffic in Oklahoma is on the jump despite QRN. As the stations of Oklahoma become known traffic is intrusted with them."

A.D.S. Poor of The McAlester Territory states that his section has continued in a slump this month. He is changing from a half to one K.W. 5KW is installing a C.W. set, also 5HF at Oklahoma City.

A.D.S. Selby of The Muskogee Territory informs us that there are several good stations at Muskogee. Among them is the famous station 5BR who has been reported QSA in New York and Pennsylvania states. Muskogee is proving to be a very important point and much traffic is being handled, being located on Trunk Line F. 5LO of Miami is installing some new equipment. A new station has sprung forth at Enid, his call being 5JR.

5HL and 5HK have consolidated as station 5HL and will afford two operators, maintaining a better watch than heretofore.

D.S. Falconi of Roswell failed to send us a report. (S'matter, Louie?—White).

D.S. Harold P. Heafer reports The Waco Texas Territory has had very little activities account heavy QRN. A.D.S. Martin of The Amarillo Texas Territory reports he has received confirmation that his station (5IF) has been heard in 14 states, and his enthusiasm is greatly increased. A.D.S. Pierce states activities in The Corsicana Texas Territory are slow, as many stations are being remodeled and QRN heavy.

No reports were received from A.D.S.'s, Dorsa of The Dallas Texas Territory, and Butcher of The Greenville Texas Territory.

A.D.S. Guy Neel, pro tem, of Dublin Texas, reports traffic going through. From December 15th until Feb. 10th he handled a total of 190 messages which were not included in our report of previous date.

Due to the fact that the original plan of assigning territories has out-grown itself, it has been decided to make changes in the entire North Texas District in the line-up of A.D.S. These changes have been carefully considered at a meeting of the D.M., A.D.M. and the D.S., and were approved and adopted as official, effective April first. For the information of those concerned we present our plans. Let us say that one point we desire to bring out is the appreciation and admiration we want to express for the valuable assistance and co-operation shown by the old A.D.S.'s, of the entire Northern Texas District. We feel sure that the A.D.S.'s whose offices expire will readily see that the change is made solely for the purpose of benefitting the League, and that they will continue to lend their co-operation to the new A.D.S.'s.

After April the first, The Northen Texas District will be divided into three territories only, namely: (1) EASTERN, (2) CENTRAL, (3) WESTERN. (1) The Eastern Territory will have headquarters at Dallas, with Mr. John Dorsa as its head, and this Territory shall consist of all Counties west from the boundary line of Louisiana to the western boundaries of the following Counties: Cooke, Denton, Tarrant, Johnson, Bosque, Coryell and Lampasas, extending the entire length north and south of the District. (2) The Central Territory will have headquarters at Dublin, Texas, with Mr. Guy Neel as Asst. Dist. Supt., and this Territory will consist of all counties west from the boundary of The Eastern Territory named hereinabove to the western boundary lines of the following counties: Hardeman, Foard, Knox, Haskell, Jones, Taylor and Runnels, extending the entire length north and south of the District. (3) The Western Territory will have headquarters at Amarillo, Texas, and Mr. J. L. Martin will be in charge of this Territory, and it shall consist of the counties west from the Central Boundary Line named herein, to the extreme eastern state line of New Mexico.

The southern boundary line of The Northern Texas District is considered as the southern boundary of the following Counties: Andrews, Martin, Howard, Michel, Coke, Runnels, Coleman, Brown, Mills, Lampasas, Bell, Milam, Falls, Limestone, Freestone, Anderson, Cherokee, Nacogdoches and Shelby.

Mr. Yewell Cornelius, President of The Fort Worth Radio Club, informs the A.D.M. that internal disputes which have been numerous with his club have been thrashed out and, their Club is more encouraging than ever before.

There are two 1K.W. stations, one ½K.W. station, one ¾K.W. station and about a dozen spark-coils in Fort Worth.

The Club at Ft. Worth has made application for affiliation with our League, and

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they are installing a radiophone set this summer. They are situated like the Dallas Radio Club, they meet in a church building. Their permanent headquarters are located in the Sunday School building of the First Baptist Church of Fort Worth.

D S. Tilley, of The Southern Texas District reports Radio activities in Austin and vicinity have been an impossibility for the last month on account of the terrific QRN. The Austin stations have about quit for the season except 5ZU who is getting lined up in the new location for the summer run.

A.D S. Alfred P. Daniels, of Houston reports as follows: It is with regret that the report from this territory, will of necessity be very uninteresting this month, for the reason of the fact that practically all high powered stations have been shut down since February 19th. QRN has been playing with us, and if he calls it a visit, it resembles a visit of our country cousins and other relatives. The only DX work possible is with stations located within the adjoining counties.

This territory has lost a good station, 5EO, located at Freeport, Texas. Operator John Whitworth has moved to Waco, Texas, but promises a good station there.

Much C.W. is being heard in Houston. Most of the experimenters are still in the heterodyne stage, but are having good results with that arrangement.

Port Arthur, Texas has organized a Club with L. W. Hatry as President, and will be ready for affiliation shortly.

5HV and 5IF are being heard regularly at all Houston stations.

Re our monthly report in March issue of QST please be advised that all A.D.S.'s, monthly reports must be in the D.S.'s hands not later than the fifteenth (15th) of each month and not the eighteenth (18th). This report is very important so please see that these instructions are followed out. Total messages 369.

NORTHWESTERN DIVISION
J. D. Hertz, Mgr.

QRN is coming boys, but along with it seems to be coming better working conditions. Most of the fellows report that while Old Man Static is stirring up more or less of a fuss, still they seem to be having less trouble with QSS.

A.D.M. Cutting, reporting from Montana, says there are now three routes for traffic over the great Northern trunk line, the trunk which proved itself the most consistent, and most consistently speedy during the recent A.R.R.L. Transcons. These routes are: via 7CC to 7EX to 9WU or 9EE; via 7YA to 9YW; via 7CC or 7ZH to 7ZG to 9YW, 9WU, or 9EE. There seems to be a preference for the last two, due to QSS trouble between 7EK and 7CC.

Satisfactory daylight tests have been conducted between 7ZG, 7LU and 7DH. Others are being arranged between 7ZG and 7EX and 9WU.

Cutting's own station, 7LY, is now on the job and doing good DX work. He is in direct communication with 7HS, 7YA, 7ZG and 6OT.

We are promised a new station, 7LM, at Yakima, Wash. This station is undergoing extensive overhauling for the relay work, and will be on the job to help keep trunk "A" open during the summer.

Mason reports that Seattle has been a pretty dead place during the past month, even tho Seattle stations have been handling the bulk of the Tacoma outbound traffic. Most of the business thru this city has been going via 7AD and 7BK, tho 7IY and 7CA have been doing good work. He also says that there seems to be a CW craze raging there.

7CC is busting in a second op. This will help a lot toward keeping Moscow on the map as a most reliable radio relay center. Woodworth reports that there is every prospect that Trunk "A" will be kept open this summer, for the "Nines" are now rolling in even better than ever during the winter. And with 7EX and 7ZG in Montana doing their best to keep things open there is no reason why things should get "'gummed up." 7FI and 7BQ of Pullman are also doing commendable relay work.

At Portland 7DS, 7ED, 7BP, 7ZI and in Vancouver 7CU, 7BJ and 7ZK are keeping traffic for this district moving well. Difficulty is still encountered in working north to Puget Sound points, and some trouble is experienced working 7CC now on account of QSS, but traffic south continues to move without delay to innumerable sixth district stations.

Total messages 407. Busiest station 7CC. Jack Woodworth, Moscow, Idaho.

PACIFIC DIVISION.
E. G. Arnold, Asst. Mgr.

Things have been getting pretty bad around San Francisco Bay. It is almost an impossibility to do any work on a wave of 200 meters. We are glad to report that several new names have been added to the list of special license stations in this district.

By carefully placing these special licenses in the hands of the people most fitted to handle the work it has made it possible to handle the work in a more reliable and efficient manner.

6ZM, Mr. Wilson of Salt Lake City, Utah, has proven himself of valuable importance in our A.R.R.L. work. Traffic has been handled with him from the coast fairly regularly at a speed that is surprising, as 30 words is slow for Mr. Wilson.

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6ZY, Mr. Roebuck of Santa Barbara, Cal., will have his 375 wave in operation shortly and then we are assured of a relay station for southern traffic eliminating long unnecessary jumps. The set will be in the hands of a man who is a real operator.

Old 6EJ now 6ZX reports that he has handled 300 msgs. during the month.

Routes are open to the East via South: 6ZZ ex 6IG of Douglas, Ariz., and 5ZA, of Roswell, New Mex.

Routes open to East via North: 7YA, 7CC.

We are practically assured that it will be possible to keep the line running in full blast the entire summer.

7YA is easily worked, in fact has been worked by 6ZR of Burlingame, Calif., in broad daylight.

6OH of Ukiah, Calif., reports that he has handled 36 messages for this month, which is very good considering his location.

The A.R..R.L. QRX period originated by our manager Mr. Bessey, the purpose of which is to listen for eastern and other distant stations, is being observed around the Bay District, due to the strenuous efforts of the men in charge, 6ZR and 6AT. It is rather a big job due to the number of junior operators now on the ether, as well as the numerous ambitious CW and fone stations, who are always anxious to have the world in general hear their latest jazz piece on their fony-graph. QRN has been interfering with this plan and unless it abates to some extent the plan may temporarily be abandoned. This is a big job and requires the co-operation of all concerned, and it would be greatly appreciated by the men in charge if everyone would help them in this matter.

ALASKAN DIVISION.

Roy Anderson, Mgr.

Practically every town in Alaska has a Commercial or naval radio station, the power of which varies a great deal. Nevertheless it is always sufficient to cause a great deal of QRM and it probably has a tendency to discourage amateur radio, altho there is no reason why it should if the amateur has a genuine interest in the game But that is just it. They have no incentive. They have no one with whom they can communicate. They have no fellow amateurs, and they have no organization. That is where the A R R.L. will figure should the manager of this division be successful in rounding up such amateurs.

As regards QRN very little trouble is experienced, especially in southeastern Alaska. This is probably due to the fact that it is situated in the temperate zone. Naturally there is some, but not enough to seriously hinder the handling of amateur traffic. There is, however, SOME trouble experienced from induction, but it is very seldom that it becomes necessary to take off the phones and turn off the bulb. The only thing that necessitates that is sleet, being driven around the aerial by wind in such a manner that one is able to get a gretty good spark on the lightning switch.

Therefore, the writer believes that communication by means of amateur radio, in Alaska, is possible, if the right kind of stations with the right kind of operators are put in. Patience, to a certain extent, will count a whole lot in the handling of such traffic, but we should grin and bear it, for amateur QRM in the "states" is probably a whole lot worse than can ever be caused by Alaskan stations handling commercial traffic.

Let's hear from Alaskan amateurs.

ONTARIO DIVISION

A. H. K. Russell, Mgr.

Citizen wireless in Ontario is much as usual, with progress slow but steady. Intercity traffic is increasing and Toronto District is at last in touch with Brantford and Napanee. A new station in Peterboro gives us promise towards Ottawa, in Mr. Sherwood, 3MB.

Caton, Napanee, is hoping to install a power C.W. set soon, and mentions communication by C.W. between, Napanee, Kingston and Belleville. One way traffic is at present carried on between 3FE and 3AB, Toronto.

In Toronto, a veritable epidemic of QRM has burst forth, and it is almost impossible to work through to American stations thru the interference barrage. However, a fair number of messages have gone thru via 8CG and 8ANJ. 3AB has established communication with 3BA in Brantford, and has been copied in Chatham by XEM, the Training School Station, (which already has worked 8ZR and other stations to the south), on both C.W. and voice. Wm. Gray in Chatham, 3FM, has a DeForest 4 bulb transmitter with which he is doing good work. In Kitchener station 3DS is beginning to reach out, and is remodeling his aerial in the hope of making Toronto traffic regular. He has at present a one way schedule with 1HAA, which has had good results, several messages having been forwarded in that way. Total messages 22.

Do you want an appointment on a relay route? Write your Division Manager and give him a description of your station.

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Who's Who in AMATEUR WIRELESS





F. Clifford Estey

Is there anyone who doesn't know Estey, whose fame has been sung up and down the country as the able president of the Essex County Radio Association, with headquarters in Salem, Mass.?

Born in Middleton, Mass., June 5, 1893, he moved to Salem in 1906 and has since called that place home. He had to start in the radio game some time, of course, so chose an early date—about 1906—and struggled thru the days of coherers and decoherers, carborundum and electrolytic detectors, and once even saw a Marconi magnetic detector. He had his first transmitter before he knew there was a code; it was a pair of those awful "transformer coils" with electrolytic interrupters; later he bot a 1 k.w., closely followed by 2 k.w. and then by 3 k.w., using a wave length of 1600 meters, and only the radio law of 1912 saved him from bankruptcy. During 1911

(*Concluded on page 46*)



Don I. Bailey

Operator "DA" of Radio Station 9CS, Clinton, Iowa, was born in Luverne, Rock County, Minnesota, moving with his folks to Iowa at the age of 11 years. There, after experimenting with different vocations—automobiles, motor boats, cartooning, drafting and Morse line telegraphy—he finally became a disciple of Marconi.

He was then a reader of "The Open Exhaust" (a motor-boat publication) and happened to be looking over the classified ads. one day when he noticed the Mississippi Valley Power Boat Association had two complete wireless sending and receiving sets for sale for $25.00, used only a half hour in timing the mile-against-time dash. He wrote the secretary of the M.V. P.B.A. to hold the sets for week and he would take them off his hands. The secretary didn't wait, but shipped them at once. The sets consisted of two pairs

(*Continued on page 46*)

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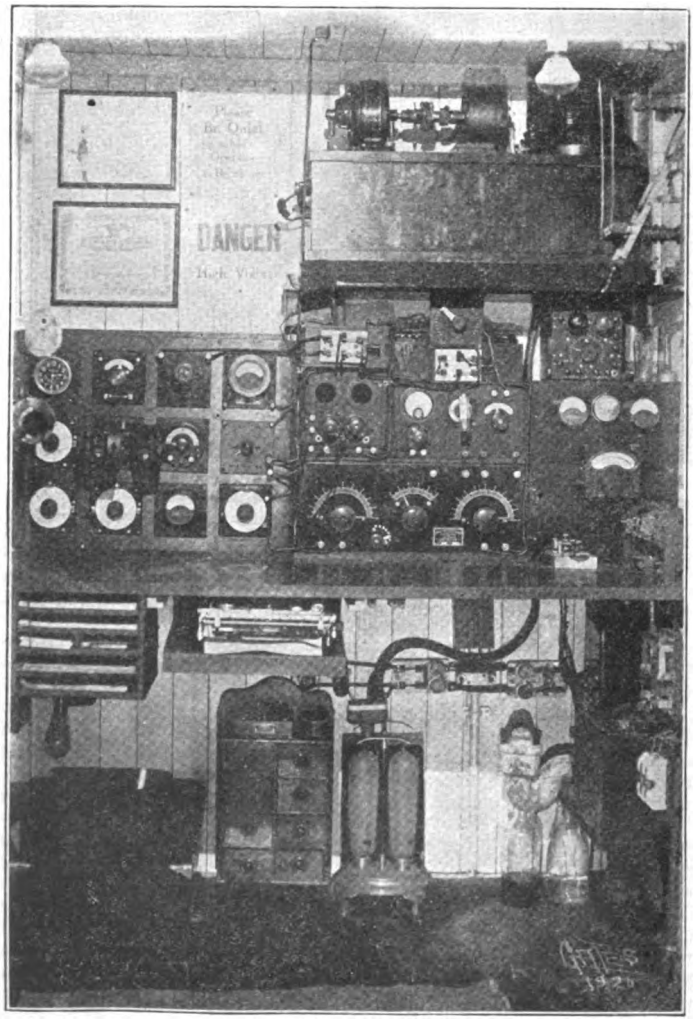


Amateur Radio Stations



4BQ—A Southern Station

From time to time the A.R.R.L. has wished there were stations in the East Gulf Division. What we meant was more stations like this one, 4BQ, owned by Mr. G. L. Hight, of Rome, Ga.



Taking up the antenna first, Mr. Hight has a steel tower of 125-ft. over-all height. The height of the tower proper is 85 ft., with an extension of two 23-ft. lengths of 2-inch galvanized pipe welded together and reinforced at the joint with 4 ft. of shafting turned to a driving fit. The 85 ft. part cost $145, and Mr. Hight considers such an aerial support the cheapest and best in the long run. The aerial at present used is a cage of eight stranded wires 90 ft. long, running almost vertically. It has one hoop at each end, 8½ ft. in diameter, with the lower end of the cage coming directly to the lead-in bushing immediately over the transmitter. The ground system is quite a conglomeration, consisting of several hundred driven rods, several charcoal pits with water connections for moistening, chicken wire, copper ribbon in radial ditches, all the usual piping systems, and an iron fence.

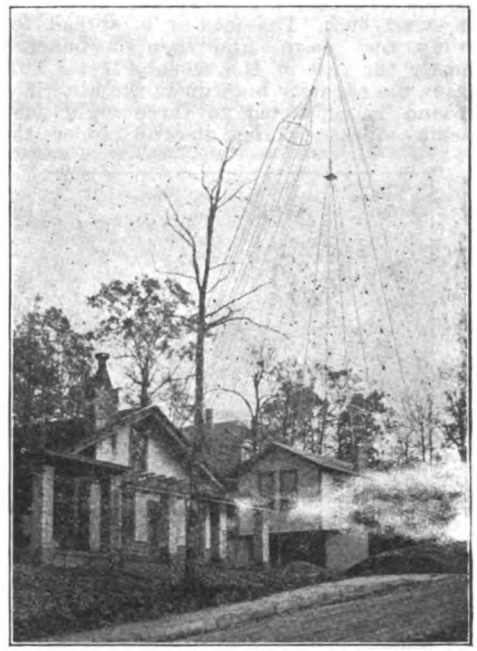
The transmitter is the old-style Clapp-Eastham Hitone, and with 4 amperes antenna current and a pure 200-meter wave, 4BQ has been heard several times in North Dakota, a distance of 1300 miles.

As to the receiving equipment, on the

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left is a DeForest unit set using honeycombs for waves over 600 meters, and on which most of the European stations are copied with one bulb. A Chicago Radio Laboratory regenerator in the foreground is used for amateur work, while the two-step amplifier immediately over it can be used on either set.

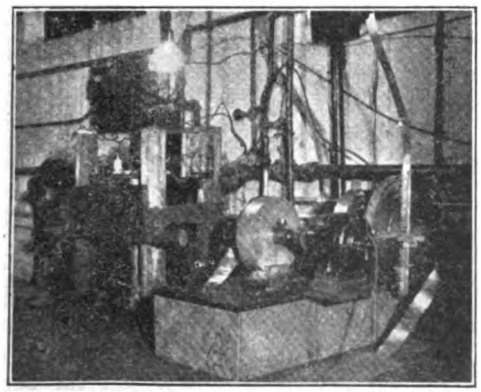
4BQ is fixed up with lots of little conveniences. Note the stationary cabinet and the Corona on a sliding drawer under the table, the electric stove, Tungar rectifier, the cabinet for tools and spares. The radio headset may be connected to the city phone, shown on the extreme left, so that land-line communication can be had without removing the headset, while in addition the phone line can be connected to the receiving set so that Mr. Hight can call up his friends and let them listen to radiophone concerts he receives. This is done by the simple expedient of running one side of the main line of the telephone thru the primary of an Acme modulation transformer and connecting the secondary in series with the radio headset, which is the most satisfactory way discovered and in no way interferes with the operation of either the telephone or the receiving set.



3XM, PRINCETON UNIVERSITY

3XM is probably better recalled to mind by the call letters it had until recently, 3DH.

Perhaps the main feature of the whole 3XM equipment is its simplicity and lack of the usual myriad of switches and what-not that one sees in the average amateur station. The receiving set and control room is in the Science Building and consists a Paragon RA-6, four pairs of phones in series, and detector-two-step-amplifier unit mounted on a long table. The only remaining things on the table are two keys, power relay, and a switch for the rotary gap. The receiving aerial is one wire going up over the roofs to a tower 120 feet high. It is two hundred feet from the sending aerial and sending set, which is located across the street in the pump room.

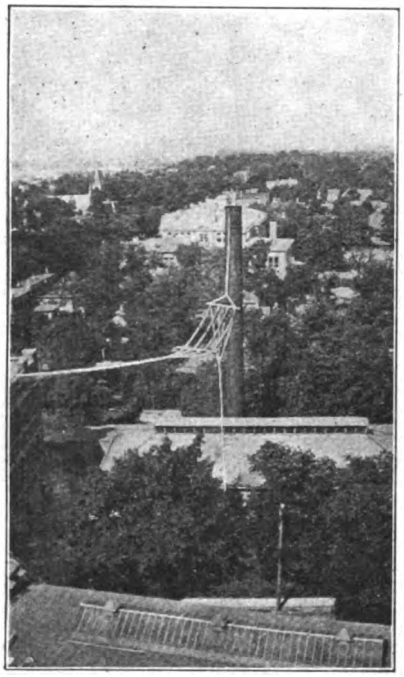


The sending set consists of a specially built American constant-voltage (40,000) transformer, which complete weighs 500 pounds. The condenser is of three units of 50 plates each, of 10" by 14" double thickness window glass, oil immersed. The three units weigh together about 400 pounds. The oscillation transformer and connections are all three inch brass ribbon. The rotary is a specially built quenched, the disc having fourteen points and four stationary electrodes. It is directly coupled to a 1/6 h.p. 1750 r.p.m. induction motor, giving a rather peculiar note.

The transmitting aerial is an inverted L, one hundred feet high and seventy-five feet long, the horizontal part having four wires on ten foot spreaders. A steel cable bears the strain, the aerial hanging about two feet below it. There is 60 feet of one inch rope on each side of the antenna in place of the usual cable, preventing unnecessary absorption and giving much better insulation. The aerial is supported by a 100 foot steel stack sixty feet from the east end where the lead-in is, and by a

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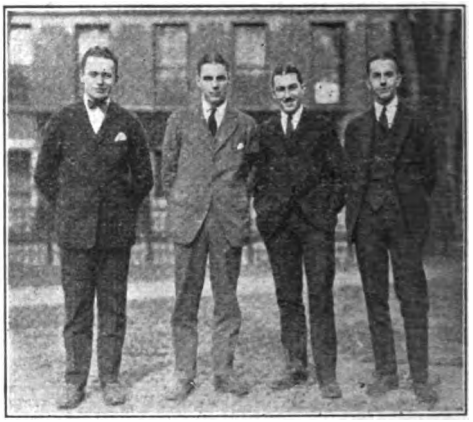
steeple 120 feet high and 150 feet from the west end. The lead-in is spread for thirty feet down, and then is bunched loosely the rest of the seventy feet. This keeps the capacity high up in the air. The ground is connected to three eight inch steam pipes running directly under the



antenna in an underground passage across the street.

3XM employs a very simple break-in system in which the receiving set is always working, a ½ megohm resistance on the detector tube preventing the bulb from paralyzing and a needle gap across the aerial and ground keeping the absorbed energy from sparking in the receiving set. The sending set is controlled by relays. This system works perfectly, and there is no such thing as a change-over switch employed; in fact the only switch used controls the relay starting the rotary.

The call 3XM is used for the spark set, and 3DH is still used for the bulb set (phone, C.W., and I.C.W.).

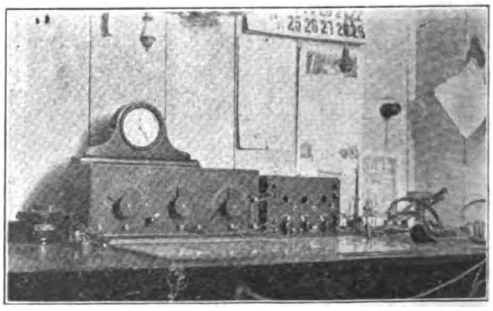


The owners of 3DH and 3XM, shown in our photograph, are, from left to right, Don Murray (DM), Sam Grandin (SG), D. W. Richardson (DR), and Ted Sisson (ES). Folger Frost (FF) is also an owner but must have been on watch when this photograph was taken.

3XM has been copied in all but eight states, in the English Channel, in the Pacific ocean off Mexico and in the Atlantic South of Pernambuco, Brazil. The best actual working records are 9LA; LG, three nights running from Havana to Tampico; HK, from New York to Cuba; DZ, five times while lying at anchor in Tela, Honduras, S. A.

5EJ, AUSTIN, TEX.

Here is the station of Mr. W. L. Gilfillan, Austin, Tex. The aerial is a 4-wire inverted L, 55 ft. long, supported on two masts 92 ft. and 55 ft. high respectively. The spreaders, which are 16 ft. long, are a truss construction giving great strength with light weight. The transmitter consists of a United Wireless transformer, Benwood gap direct-driven, home-made oil immersed condenser and home-made pancake O.T. 5EJ had a new idea in distant control, pull cords operating the gap and transformer switches and so eliminating any A.C. hum in the receiving room. The handles for these cords may be seen high up in the picture of the receiving equipment, which comprises a pre-



war Paragon RA-6, a Grebe detector and

(*Concluded on page 62*)

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Calls Heard



HEARD DURING MARCH
Unless Otherwise Specified

Instructions to reporters:

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

HEARD AT SEA.

"DZ" while in port 976 miles south New Orleans, from January 29 to March 10th.
2EL, 2JU, 2RK, 2UC, 3DH, 3EN, 4AG, 4AM, 4AT, 4BK, 4EK, 4XC, 4YE, 5BI, 5CG, 5DI, 5DW, 5EJ, 5ER, 5EW, 5FL, 5HL, 5HW, 5JA, 5JE, 5LA, 5LS, 5XA, 5XB, 5XC, 5YE, 5YH, 5ZA, 5ZC, 5ZD, 5ZF, 5ZP, 5ZR, 5ZU, 5ZV, 5ZX, 8ADE, 8AN, 8BO, 8FT, 8ID, 8IK, 8KP, 8ML, 8WY, 8XS, 8ZA, 8ZC, 8ZJ, 8ZL, 8ZR, 8ZX, 8ZY, 9AAC, 9AAF, 9AAV, 9AC, 9AEG, 9AEQ, 9AEY, 9AFX, 9AGY, 9AKC, 9AMK, 9AON, 9AT, 9AU, 9BW, 9CA, 9CP, 9EL, 9EQ, 9FF, 9FU, 9HI, 9HN, 9HT, 9JN, 9JQ, 9KD, 9KL, 9KO, 9LA, 9LB, 9LC, 9LQ, 9LR, 9MC, 9NQ, 9OE, 9OX, 9PS, 9PV, 9PW, 9QO, 9TV, 9UU, 9VC, 9VZ, 9WI, 9WO, 9WW, 9XM, 9XT, 9YA, 9YC, 9YM, 9ZA, 9ZB, 9ZE, 9ZJ, 9ZL, 9ZN, WL2 C.W., NSF C.W.

Opr., S. S. "City of Flint": Ja.n 18, off east Florida Coast, 8XI, 8ZR. Jan. 22, 100 miles east Norfolk: 1RAY, 8PU. Jan. 24, 750 miles east Norfolk: 1TS, 1HAA, 2AX, 3DH.

2BZ aboard S. S. "Virginia", 1000 miles east of Newport News: 1JB, 1AW, (up to 1600 miles), 1YB. 1UD, 1HAA, 2RK, 2OM, 2TF, 2AHK, 3NB, 3BP (Canadian), 3PU, 3DH (up to 2000 miles), 8MF, 8ZL, 8XE, 8RQ, 9DBT, 9MH, 9ZL, 9DV, (Time when heard unknown—Ed.)

CANADIAN, 3AB, TORONTO, ONT.

All C. W.—2AJF, 2BML, 2ZL, 2ZM, 3AAO, 3ABI, 3MME, 4ZC (8ANJ), 8AGZ, 8IB, 8IK, 8KM, 8JM, 8PJ, 8UK, 8VM, 8VS, 8ZG, 8ZW, XF1.

CANADIAN 3CA, TORONTO, ONTARIO.
March.

1AW, 1HAA, 2BGM C.W., 2EL, 2RK, 2XX fone, 2ZM, Canadian threes too numerous, 3DH, 3EN, 3XF, 3YK, 4XB C.W., 5JD, 8AAW, 8ABZ, 8ACF, 8AGD, (8AGK), 8AIB, (8ANJ), 8ARO, 8BG, 8BO, (8BV), 8CAN, (8CG), 8DP, 8FC, 8FI, 8FK, 8FO, 8GI, 8HA, 8JL, 8KP, (8KZ), 8LV, 8NQ C.W., 8NZ, 8OI, 8OM, 8RQ, 8SP, 8TN, 8XI C.W., 8ZE, 8ZL, 8ZR, 8ZX, 8ZY, 9AAW, 9AAY, 9ABL, 9AOJ, 9AP, 9AR, 9AWX, 9AYE, 9DIW, 9ET, 9FG, 9FS, 9GP, 9HK, 9JA, 9JT, 9KF, 9LQ, 9OE, 9OO, 9QO, 9QR, 9TJS, 9TWA, 9TXU, 9TZX C.W., 9UH, 9UK, 9WE, 9WN, 9XM, 9YA, 9YB, 9ZL, 9ZN, 9ZR.

1HAA, MARION, MASS.

((1AK), (1AW), 1BW, (1BBL), 1BBX, 1BAB, (1CY), (1CK), (1CZ), 1CAG, 1CG, (1CM), (1DY), (1DA), 1DAV, 1DAC, 1DAP, (1EAV), (1EP), (1EK), (1EBS), 1EAT, (1FB), (1FV), (1FBF), (1FBV), 1GY, (1GM), (1GZ), (1GBT), 1HA, (1HAL), (1HO), 1IS, 1IE, (1JBT), (1JAR) (1NAQ), 1NBW, (1OE), 1OBE, (1OAD), 1PY, 1PAW, 1PB, (1QP), (1RV), (1RAY), 1RU, 1RBD, 1SU, 1SN, 1SZ, (1TS), 1TBA, (1UQ), 1UAG), 1UN, 1VAA, 1WAD, 1XT, 1XX, 1XE, (1YB), (1YA), 2AFP, 2ALK, 2AID, 2ABM, 2ACG, 2AHS, (2BO), (2BK), (2BGR), 2AZP, 2ANZ, (2BM), 2CY, (2DA), (2DI), 2DR, 2DK, (2EL), 2FG, 2FD, 2GB, (2JU), (2JZ), 2MME, (2OM), (2OA), (2RK), 2KY, (2TF), (2VA), (2VH), (2ZC), (2ZL), 2ZV, 2WZ, 2XE, (2HN), (3AIC), (3ALN), (3ACS), 3ABC, (3BG), 3CG, 3CM, (3DH), 3DE, (3GX), (3HJ), 3HG, 3HX, 3IB, 3LS, 3NB, 3OU, 3OF, (3PU), 3QW, 3XF, (3ZA), 4AT, 4YE, (8AMZ), (8AGK), 8ANJ, 8AOT, 8ANT, 8AAZ, 8AM, 8ANG, 8ANK, 8AAM, 8AKJ, 8BC, 8BO, 8BP, 8CD, 8DR, 8FN, (8GI), 8GB, (8HP), 8HF, 8HQ, 8IZ, 8JU, 8KZ, 8LM, 8LQ, (8ML), 8NZ, 8LH, 8PL, 8PQ, 8QM, 8QE, 8QQ, 8RG, 8RW, (8SP), 8SH, 8TB, 8TZ, (8WY), 8XH, (8XE), (8XU), 8ZA, 8ZW, (8ZL), 8ZV, 8YV, 9CA, 9EL, 9FN, 9HM, 8MN, 9OC, (9ZN).

1MD, DORCHESTER, MASS.

1BAB, 1GBC, 1JAU, 1NAJ, 1OE, 1QP, 1RAY, 1TS, 1YB, 2AID, 2AJW, 2AXB C.W., 2CT, 2DA, 2DN, 2DR, 2EL, 2FG, 2JJ, 2JU, 2OA, 2OM, 2OO, 2RK, 2RM, 2SZ, 2UC, 2VA, 2XQ, 2ZL C.W., 2ZM C.W., spk., 3ACM, 3AD, 3ALN, 3CC, 3DH, 3EH, 3EN, 3GO, 3HG, 3HJ, 3HX, 3KM, 3NB, 3OU, 3PU, 3XF, VMI, 4AL, 8AD, 8AGK, 8AIO, 8AKA, 8AL, 8ALS, 8AMQ, 8AMZ, 8AOT, 8AWX, 8BC, 8BO, 8CG, 8DR, 8DV, 8FK, 8GB, 8GI, 8HG, 8HY, 8ID, 8JQ, 8JE, 8KP, 8KZ, 8LF, 8MF, 8MM, 8QE, 8QH, 8RQ, 8RW, 8UK, 8WY, 8XE, 8XI, 8ZE, 8ZA, 8ZD, 8ZL, 8ZR, 8ZY, 8ZZ, 9UH, 9AWZ, NSF.

1HO, BRIDGEPORT, CONN.

1AW, 1BBL), 1CZ, 1CAZ, 1EAV, (1FL), (1FY), (1GAT), 1GBT, 1HA, (1HAA), 1HAF, (1NAZ), 1OE, 1PG, 1RAY, 1UL, (1QN), (2AID), (GC), (2AJW), 2BG, (2BGR), 2BML, 2DK, 2DN, 2DR, 2DS, 2EL, (2HJ), 2JU, (2OA), (2OW), 2RB, (2RK), 2SS. (2UA), 2VD, 2XX fone, 2XAC fone, 2ZL fone. 3AC, 3CC, 3EN, 3FB, 3FJ, (3FR), 3GO, 3HG, 3HX, 3IX, 3KM, 3NB, 3OU, 3PU, 3TS, 3TK, 3VV, 8AI (8AAZ), 8ACF, 8AGD, 8AGK, 8AIO, 8AMJ, 8AMM, 8AMQ, (2AMZ), 8OT, 8AWX, 8AXC, 8BB, 8BC, 8BO, 8BV, 8DC, 8DR, 9DZ, 8FE, 8HP, 8HR, 8HY, 8IN, 8IP, 8JE, 8JQ, 8MZ, 8RP, (8RQ), 8SP, 8TT, 8WY, 8XU, 8ZN, 9ME.

1TS, BRISTOL, CT., one tube.

1ABI, (1AW), 1BAB, 1BBL, (1BV C.W.), 1CBT, 1CK, 1CM, 1CP, 1CY, 1CZ, 1DAP, 1DH C.W., (1DR), 1DT C.W., 1DY, 1EAV, 1EBW, 1EP, 1FPB, (1FBK spk. & C.W.), 1FBV, 1FU, 1FV, (1AI), 1GAN, 1GAY, 1GBC, 1GBT, 1GM, (1GY), 1GZ, (1HAA), 1HAF, (1HBP C.W. & fone), 1HO, 1IA, 1IAO, 1IAP, 1IBD, (1IBJ C.W.), 1JAP, 1JAU, (1JBF), 1JQ, (1JX), (1KAZ C.W.), (1KBL C.W.), 1KBM, (1LAP), 1LAS, 1LBR, 1MAD, 1MAU, 1MX, (NAQ spk. & C.W.), 1NAT, 1NBJ, 1NBS C.W., (1OAA), 1OAD, 1OBE, 1OE, 1OT, 1PAW, (1PBA), 1PG, 1QN, (1QP), 1QR C.W., (1QT), (1RAS), (1RAY), 1RD C.W., 1RZ C.W. & fone, (1SAZ), 1SN, (1SZ), 1TBA, 1TBJ, 1TL, (1UJ), 1UL, 1UN,

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spk. & C.W., (1UQ), (1VAA), (1VAK), 1WBL C. W., 1WR, 1XM, 1XV C.W. & fone, (1YB), 1YK, 2ABM, 2AFP, 2AJE, 2AJF C.W., 2AJW, 2AKO C.W., 2ALD, 2AQF, 2AR, 2ARD C.W., 2ARY, 2AVR, 2AXB C.W., 2BCC, 2BEH, 2BGH. 2BGN, 2BGR, 2BK, 2BKT, 2BL, 2BM, 2BML C.W., 2BPL, 2CL, 2CT, 2DA, 2DN, 2DR, 2DX, 2EL spk. & C.W., 2FG, 2HC, 2HI C.W., 2IG, 2JB C.W., 2JJ, 2JR, 2JU, 2KP, 2LO, 2MJ, 2MP, (2NN), 2OA, 2OM, 2OX, 2PL, (2RK), 2RM C.W., 2SK, 2SQ, 2SS, 2SZ, 2TB, (2TS), 2UA, 2UC, 2UK, 2VA, 2XG C.W., 2XK C.W., 2XQ spk. C.W. & fone, 2XX C.W., 2ZC, 2ZL C.W., 2ZM spk. & C.W., 3AAE C.W., 3AAG, 3AAN, 3ABD, 3ABI C.W., 3ACD, 3ACM, 3ACQ, 3AFE, 3AHK, 3AIC, (3AN), 3ATZ, 3BA, 3BK, 3BZ, 3CC, 3DH, 3DM, 3DS, 3EH, 3EN, 3EX, 3FB, 3FG, 3FJ, 3FR, (3GO), 3GX, 3HJ, 3HX, 3IB, 3IF, 3IM, 3IX, (3KM), 3LP, (3NB), 3OU, 3PS, 3PU, 3QF, (3RW), 3UF, 3VV, 3XK C.W., 3XM, 3YE, 3YK, 3YV, 3ZA, 3ZS, 4AL, (4CX), 4EY, 4FD, 4GN, 4XC, 5XA, 5YH, 8AAV, 8ACF, 8AD, 8AEE, 8AGD, (8AGK), 8AGO, 8AGZ C.W., 8AHZ, 8AIO, 8AIS, 8AJW, 8AL, 8AMM, 8AMQ, (8AMZ), 8ANJ, 8ANO, (8ANT), 8AOT, 8AP, 8APB, 8APH, 8ARW, 8AWX, (8AXC), 8AVD, 8BB, 8BBW, (8BC), 8BO, 8BV, 8CF, 8CG, 8CH, 8CS, 8DC, 8DI, 8DR spk. & C.W., 8RT, (8DV), 8FC, 8FK, 8FN, 8FO, 8FT, 8FQ, 8GI, 8HA, 8HP, 8HR, 8HY, (8ID), 8IK spk. & C.W., 8IN, 8JE, 8JQ, 8KM spk. & C.W., (8KK), 8KP, (8KZ), 8LF, 8LQ, 8LX, 8MF, 8MG, 8ML, 8MM, 8MT, 8MZ, 8NI, 8OI, 8PJ C.W., 8PN, 8PT, 8QC, 8QE, 8RQ, (8RU), 8SH, 8SP, 8TJ, 8UK spk. & C.W., 8VM C.W., (8VQ), 8VS C.W., (8VW), (8WY), 8XE, 8XK C.W. & fone, 8XR C.W., 8XU spk. & C.W., 8YG C.W., 8ZA, 8ZD, 8ZE, 8ZG C.W., 8ZL, 8ZR, 8ZV C.W., 8ZW, (8ZY), 9AAC, 9AAW, 9AB, 9ACM, 9AGR, 9AOH, 9AON, 9AWZ, 9BP, 9CA, 9CP, 9DBT, 9DV, 9EQ, 9FG, 9FS, 9HJ, 9HN, 9HR, 9JN, 9KB, 9KC, 9KF, 9M, 9KV, 9LF, 9LQ, 9PV, 9UH, 9UU, 9VZ, 9XAC C.W., 9XI C.W., 9XM spk. & C.W., 9YA, 9YB, 9YI, 8ZB, 8ZJ, 9ZL, 9ZN, Canadian: 3AB C.W., 3BP, (3EI), NSF C.W. & fone, WWV C.W.

2RK BROOKLYN, N. Y.—February 15 to April 13

(1AE), (1AS), (1AW), (1BB), (1BBL), (1CK), (1CM), (1CY), (1DR), (1DQ), (1DY), (1EP), (1EAV), (1EBW), (1FV), (1GY), (1GBC), (1HAA), (1IA), (1JAP), (1JQ), (1MAU), 1OBE, (1OE), (1QM), (1QP), (1RAD), (1RAS), (1RAY), (1VAA), (1WQ), (1XM), (1XT), (1YB), (3ABD), (3ACI), 3ACT, 3AHK, (3AIC), (3ALN), (3BG), (3BH), (3BZ), (3CC), (3DC), (3DH), (3DS), (3EN), (3EV), (3EZ), (3FG), (3GO), (3HG), (3HJ), (3HX), (3IW), (3KM), (3NB), (3OB), 3OU, (3PU), (3SX), (3VV), (3XF), (3ZA), (3ZE), (4AG), (4BY), (4CC), (4DL), (4DM), (4GN), (4RT), (4XC), (4YA), (4YB), 5DA, 5EJ, 5JD, 5JE, (5XA), (5XH), (5YH), 5ZA, (5ZL), 5ZP, (8AL), (8ACF), (8ACY), (8ADE), (8AJD), (8AGK), 8AGO, (8AIO), (8AJW), (8AKH), 8ANJ, (8ANT), (8AWX), (8AXG), (8AYN), (8BC), (8BO), (8BP), (8CB), (8DC), (8DI), (8DP), (8DR), (8DV), (8FK), (8FT), (8FQ), (8GI), (8GX), (8HP), (8HR), (8HY), (8ID), (8IK), 8IN, (8JJ), (8JL), (8JS), (8JE), (8KK), (8KO), (8KP), (8KZ), (8LF), (8ML), (8MM), (8MT), (8NI), (8OJ), (8OZ), (8PN), (8QJ, (8QM), (8RQ), (8RU), (8SH), (8SP), 8TN, (8TY), 8VW, 8WV, (8WY), (8XE), 8XH), (8XK), (8XU), (8YW), 8ZA, (8ZB), (8ZD). 8ZN. 8ZR. (8ZW). (8ZY). (8ZZ). (9AAC). (9AAO), (9AAV), (9AAW), (9ABL), (9ACJ), (9AD), (9AEQ), (9AFB), (9AGR), 9AHO, (9AJI), (9AKC), (9AMZ), (9ANV), (9AT), (9AU), (9CA), (9CD), (9CN), (9CP), (9CS), (9DV), (9EL), 9FF. (9FG), 9FJ, (9FN), (9FU), (9GC), (9GN,) 9GP, (9HG), 9HJ. (9HN). (9HR), (9HT), (9HY), (9JN), (9KB), (9KF), (9KO), 9XM, 9XW, (9ZJ), (9ZN), (9ZQ). 9ZT. (9ZV), 9ZX, (NSF) C.W. & fone, (WWV), XF1, Canadians (3BP, (3EI).

2AOS, MONTCLAIR, N. J.

1CK. 1CY, 1CZ. 1IA, 1JQ, 1OE. 1TS, 1YB, 1XM, 1BAB, 1BAO, 1BBL. 1HAA, 1HBZ, 1GBC. 1MAD. 1AW. 3AB. 3AD. 3BG 3BZ. 3CK. (3CV), 3DH, 3DS. 3EN. 3FJ. 3GO 3HG. 3HJ. 3IW. 3KM. 3NB. 3OU 3PS 3PU 3TN. 3VV. 3YV 3LY 3ABG. 3ACM. 3ALN 3XF 4AG 4AL. 4BY. 4CK. 4FD. 8AD. 8AL. 8BC. 8BO. 8CD. 8CF. 8DR 8DZ. 8EK. 8FA. 8FQ, 8FK, 8GB, 8HG, 8HY, 8ID, 8IG, 8IK, 8IN. 8JJ. 8JL. 8KE. 8JE. 8KK. 8KM. 8KP. 8KT. 8KZ. 8FT. 8LF. 8LO. 8LU, 8LX, 8MF, 8NI. 8PJ. 8PT, 8OZ, 8QJ. 8RW. 8RU, 8RQ, 8TN, 8TT. 8VQ. 8WY, 8XE. 8XQ. 8XU, 8YN, 8ZA. 8ZD, 8ZE. 8ZL. 8ZW. 8AAZ. 8AAU, 8ACF, 8ADQ, 8ADZ, 8AGK. 8AGO, 8AGZ. 8AJU, 8AKJ, 8AMQ, 8AMZ, 8AVD. 8AXC, 8TK, 9AG, 9BP, 9GP, 9KR. 9KV. 9ME. 9OE, 9PC, 9UH, 9UU, 9WE, 9ZN. 9AAW, 9ANC, 9AWL. NSF, XB1 C.W., XFT C.W., BH1. Phones:—(2RF), (2GF), 2IA, 2JZ, 2MC, (2QO), 2QR, 2RB, ((2RU), 2XB, 2XK, 2XJ, 2XX, 2XAC, 2ZM, 2ZD, 2ABZ. 2ACI. 2AJF. 2AKO, 2ANX, (2BGM), 2BIV, 2BND, 8XK, WGAD.

2TT. NEW YORK CITY.

1AW. 1BBL, 1CBT, 1CK, 1CY, 1CZ, 1DAK, 1DY. 1EBW, 1BC, 1GBT. 1HAA, 1IA, 1JAP, 1JQ. 1OE, 1VAA. 1WA, 1WQ, 1XM, 1YB, 2AR. 2OA, 2SZ, 2XQ. 3ABG. 3ACM. 3AHK. 3AK. 3ALN, 3AQ, 3AS, 3BZ. 3DH. 3XM, 3DS, 3EN, 8FW. 8GO, 3GX, 3HJ, 3MX, 3IW, 3KM. 3KV. 8LY. 3NB. 3OU, 3PU, 3VV, 3XF. NSF, WWV. XF1, 4XB C.W., 4XC, 4YA, 5XA. 8AAV. 8AAZ, 8ACF. 8AGB, 8AGD. 8AGK, 8AGO, 8AMZ, 8AIB, 8AIO, 8AJW, 8AL, 8ALY C.W. (QRA? QSC terrible) 8AXC, 8BC, 8BO, 8CD, 8CF, 8DR, 8EV. 8FK, 8FQ, 8FT, 8GO, 8GM, 8GW, 8HG, 8IB C.W.. 8ID. 8IK spk. & C.W., 8JL, 8KF, 8KK. 8KM, 8KP. 8KZ, 8LF, 8LQ. 8MG, 8ML, 8MM, 8NZ, 8OE. 8OI. 8OZ. 8PU. 8QR, 8RQ. 8RU. 8SP, 8VQ 8WY, 8XE, 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8Z C.W., 8ZL, 8ZN, 8ZR, 8ZT, 8ZW spk. & C.W., 8ZY, 9AAW, 9AGR. 9ANY, 9AWZ. 9DV, 9EL, 9GP, 9KF, 9LF, 9LQ. 9MS. 9NQ. 9OX, 9XI C.W. & spk., 9XM C.W. & spk., 9ZJ, 9ZL, 9ZN, Canadian 3EI.

2RM BROOKLYN, N. Y.—Feb. 17 to April 5.

1AE, 1AW. 1BBL, 1CK, 1CM, 1CY, 1CZ, 1DR, (1DY), 1EBW, 1GM (1GBC), 1GBT, 1HAA (dalite) 1HAF, 1JAP, 1LAX, 1LWU, 1MX, 1MAD, (1OE), 1QP, 1QT. (1RAD), 1RAS, 1RAY, 1VAA, 1XM, (1YB). 2DA. fone? 2FG. 2OA, 2SZ. 2UA, 3CC, 3CK. 3EN. 3FG, 3GO, 3HG, 3HJ, 3HX, 3JR, 3ML, 3OU, 3XF, 4DJ, 4FD, 4XC. 4YA, 8AD, 8AL, 8AAV, 8AEE. 8AGK, 8AGO, 8AHZ, (8AIO), 8AMF. 8AXC, 8BC, 8BO, 8DC. 8DG. 8DR, 8EV. 8ETX, 8FK, 8FQ, 8FT. 8GO, 8GW, 8GX, 8HG, 8IB C.W., 8ID, 8IV C.W., 8JE, 8KK. 8KP. 8KZ, 8LF, 8LQ, 8LV, 8LX, 8MF, 8MG, 8MH. 8MM. 8MR, 8MZ, 8NG, 8OI, 8OZ, 8QJ. 8RG, 8RQ. 8RU, 8SP, 8TK, 8TN, 8TT, 8UK, 8VQ, 8WY. 8XK. 8XQ, 8YN, 8ZD. 8ZE, 8ZG C.W., 8ZR. 8ZV C.W., 9AP, 9AAW. 9AEQ, 9AGR, 9AON. 9CA. 9GN, 9GP, 9HD, 9HN, 9JN, 9JQ. 9KL. 9LF, 9LQ. 9PK. 9UH. 9UU, 9WU, 9XM C.W., 9ZB, 9ZJ, 9ZN, NSF, XF1.

3QF, ARDMORE, PA.

1AW, 1CF C.W., 1CK, (1EBW), 1HC. 1GBT. 1HAA, (1IA), 1JAP. 1MAD. (1OE). 1PAW (1SBZ), 1TS, (1UD), (1XM), (1YB), 2BG, 2BK, 2DA. 2DK, 2DN, 2FG, (2JU), (2OA). 2RK, (2SZ). 2TUQ. 2XQ, (3ACS), (3AFE). 3BZ. (3DH). 3EN, (3GO), (3IW), (3KN), 3NB, 3PU, 3QE, (3QW), 3VV, (3XF), 3ZL, 3ZV, 4AG, 4AU. 4CK, 4EY, 4MI. 4XC, 4YA, 4YB, 5XA, 5YH. 5YHA. 8AAZ. (8ABZ), 8AD. 8ADY C.W., 8AEE, (8AGK), (8AIO). 8AJW, 8AKV. 8AL, (8AMZ), 8ANF. 8AU, 8AYY, (8AXC), 8AXK, (8BC), 8BO, 8CD. 8DC. (8EV), 8FE, 8FK, 8FN, 8FQ, (8FT). 8GX. 8HG, 8HY, (8ID), 8IN, 8JE, (8JL), (8KK), (8KM). 8KP. (8LX), 8MF, 8MH, 8ML, 8MM. 8MR, (8OH), 8OJ. 8OZ. (8PN), 8QE, (8RQ), (8RU). 8SG. 8SP. (8TN). (8TT). (8TY), 8VQ. 8ZA, 8ZN, 8ZR, 8ZW, 8ZY, 9AAC. 9AAF, 9AAW, 9AAZ. 9ANV, 9AON, 9AWY. 9AWZ, 9BP, 9CA. 9CP, 9EQ, 9GP. 9HM. 9HT, 9KB. 9KF, 9KL, 9LQ. 9LR, 9NQ, 9OE, (9OX). 9PV, 9UF. (9UH), 9UU, 9ZB, 9ZE, 9ZL, 9ZN, NSF XF1, XK1, Canadian 3BP, (QSA VY), 3EI. All on one bulb.

3AIC, READING. PA.

(1BZ), 1FV. 1IA, (1OE), 1QP, 1RZ, 1TS, 1XE C.W.. 1YB. (1EAV), (1GBC), (1HAA), 1IAT, 1MAD. 1MAW. 1NBS, 1RAY, 2BB, 2DA. (2EL), 2JU. 2OA, 2SZ. 2XQ spk. & fone, 2ZM. 2BGR, 3AW, 3BG, 3BZ, 3CC, 3DH, (8EI). 3EN. 3FJ, (3FR), 3GO, 3XM, 3YE, 3ZA, 3ACS, 8AHK. (XF1), 4AU, 8AR, 8BC. 8BG. 8BO, (8CH). 8HA, 8HY, 8JQ. 8KK, 8KP, 8MF, 8MN, 8RQ, 8SH, 8SP, 8WY,

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8XE, 8ZL, 8ZW, 8ZX, 8ZY, 8AEE, 8AGD, 8AGK, 8AKV, 8AMZ, 8ANJ, 8APB, 8ARW, 8AWX, 9EQ, 9KF, 9LC, 9LQ, 9ZQ.

3AGF, BRIDGETON, N. J.

1AW, 1BAB, 1BBL 1CG, 1DY, 1EP, 1FU, 1GBC, 1GBT, 1HAA, 1HO, 1JAP, 1MAD, 1NBS, 1OBE, 1OE, 1OY, 1QP, 1RAY, 1RZ, 1TS, 1VA, 1WQ, 1XM, 1XT, 1YB, 2AQF, 2BB, 2BM, 2CC, 2CI, 2CM, 2DA, 2DN, 2DR, 2EL, 2FG, 2JR, 2JU, 2KR 2OA, 2OM, 2RB, 2RK, 2SZ, 2UC, 2UE, 2UK, 2XK, 2XQ, 2XX, 2YB, 2YM, 2ZL, 2ZM, 3AAE, 3AAN, 3AAO, 3AB, 3ABM, 3ACM, 3AK, 3AKE, 3AS, 3ASF, 3BA, 3BE, 3BG. 3DDS, 3DH, 3DR, 3DS, 3EH, 3EL, 3EN, 3GO, 3GX, 3HG, 3HJ, 3IC, 3KKM, 3NB, 3OB, 3OU, 3OW, 3PB, 3PU, 3QF, 3SM, 3SZ, 3UC, 3UQ, 3XI, 3XM, 3YK, 3ZA, 3ZG, 4AL, 4YB, 5DA, 5XA, 8ACF, 8ADQ, 8AEE, 8AGK, 8AGO, 8AHU, 8AIO, 8AKJ, 8AL, 8AMM, 8AMZ, 8AOT, 8AP, 8ARK, 8ARW, 8AVL, 8AXC, 8AYA, 8BC, 8BO, 8BT, 8BV, 8CG, 8DT, 8FC, 8FK, 8FO, 8FP, 8FQ, 8GI, 8HR, 8IL, 8IN 8JQ. 8KM, 8KZ, 8LY, 8LQ, 8MF, 8ML, 8MM, 8NI, 8QE, 8RP, 8RQ, 8RU, 8SH, 8SP, 8TT, 8TY, 8VW, 8WY, 8XA, 8XE, 8XK, 8XU, 8ZA, 8ZD, 8ZE, 8ZG, 8ZL, 8ZQ, 8ZV, 8ZW, 9AAC, 9AAW, 9AWX, 9FJ, 9LQ, 9RP, 9XM, 9YB, 9ZJ, 9ZL, 9ZN, 9ZW.

XF1, WING RADIO STATION, LANGLEY FIELD, VIRGINIA.

1AW, 1BBL, 1CF C.W., 1CY, 1CZ, 1HAA, (1OE), (1QR C.W.), 1WQ, 1XM, 2ARA, (2BK), 2DA, 2DN, 2DR, 2EL, 2JU, 2LN, 2OA, 2RK, (2SZ), 2UK, 2XK, (2XX), (2ZL C.W.), 2ZM C.W., (3AAE C.W.), 3AD, 3ALN, 3CC, 3DH, 3IW, (3NB), 3PU, 3XQ, 4CK, (4CX), 4DJ, 4HT, (4XB C.W.), 4XC, (4YA), (4YB), 5ER, 5XA, (5XB C.W.), 8AGK, (8AGZ C.W.), 8AMZ, 8AIO, 8AL, 8AXC, 8AZ, 8BC, 8BU, 8CF, 8DC, 8DP, 8DZ, (8FA), (8FT), 8GX, 8HG, (8IB C.W.), 8ID, (8IX), 8JL, 8JQ, 8KK, (8KM C.W.), 8KP, 8KQ, 8LJ, 8LV C.W., 8OJ, 8ON, 8PJ, 8QJ, 8RQ, 8RU, 8TT, 8VQ, (8VS C.W.), 8XC, 8XE, 8XU, 8ZA, 8ZD, 8ZG C.W., 8ZL, 8ZQ, 8ZR, 9AAW, 9AU, 9EQ, 9FG, 9GP, 9KV, (9OX), 9SU, 9WW, (9XI C.W.), 9XM C.W., 9YB, 9ZJ, 9ZN.

4YA, ATLANTA, GA.

2RK, 2EL, 3ALI, 3DH, 3EN, (3GO), (3IW), 3XP, (3YK), (XF1), 3XP, 4AC, (4AG), 4BK, (4BY), 4EY, (4FD), (4GN), 4XB fone & C.W., 4YE, 5BM, 5DA, 5EH, 5EW, 5HL, (5HW), 5IB, 5IF, 5JA, (5JD), 5LS, 5MC, 5MY, (5XA), 5XC, 5YE, (5YH), 5ZA, 5ZAB, 5ZK, 5ZX, 8AAW, 8AGK, 8CD, 8DC, 8FT, 8IK spk. & C.W., 8KD, 8KK, 8KM, 8KP, 8PN, 8RQ, 8TT, 8XE, 8ZA, 8ZJ, 8ZL, 8ZW, 8ZY, 9AAC, 9AAG, 9ACN, 9AIZ, 9AO, 9AON, 9AP, 9ARG 9CA, 9CP, 9EL, 9EQ, 9GY, 9LF, 9LQ, 9MC, 9MMC, 9NQ, 9OE. (9OX), (9PS, dalite), 9RQ, 9TV, 9UU, 9VZ, 9XM, 9YA, 9YM, 9YN, 9ZA, (9ZB), 9ZD, 9ZN.

4DL, WEST PALM BEACH, FLA.

1AA, 1AW, 1DA C.W., 1DY, 1HAA, (1HAB), (1JAP), 2DR, 2EL, 2RB, 2RK, 2RL, 2ZL C.W., 3BQ, 3EM, 3EN, 3HX, (3HJ), 3KM, 3VV, 4AG, (4AM), 4AQ, (4BY), 4CD, 4CK, 4CG, 4EY, (4FD), (4GN), 4XA, 4XC, 4YA, (4ZC), 5DA, 5HR, 5HW, 5XA, 5YH, 5ZP, 8AGK, 8AG, 8DR, 8ID, 8JE, 9MX, 9HI, 9CA, 9OK.

4EC, WILMINGTON, N. C.

1AE, 1AW, 1BBL, 1DA, 1DN, 1DY, 1GBT, 1HAA, 1MAD, 1QP, 1ME, 1RAY, 1RU, 1UN, 1XM, 1YB, 1YK, 2AAE, 2AJE, 2AR, 2AB, 2ALK, 2AYR, 2BGM, 2BK, 2BM, 2BQ, 2DN, 2DR, 2EL, 2FG, 2HA, 2JZ, 2KY, 2PL, 2QR, 2RK, 2UC, 2UK, 2XF, 2XQ, 2XX, 2YM, 2ZC, 2ZL, 2ZM, 3AAG, 3ACE, 3AC8, 3ACS, 3AHK, 3AHW, 3AIC, 3BG, 3DB, 3DF, 3DH, 3EN, 3FG, 3GO, 3HG, 3HJ, 3KM, 3PU, 3VV, 3XF, 3YE, 3YG, 3YK, 3ZM, 4AG, 4AM, 4AN, 4AU, 4BK, 4BY, 4CG, 4CK, 4DZ, 4EK, 4FD, 4GL, 4GN, 4XB, 4XC, 4YA, 4YB, 4ZC, 5DA, 5ER, 5JE, 5XA, 5YE, 5YH, 5YI, 5ZAB, 5ZE, 8AAZ, 8ACF, 8AGK, 8AGO, 8AIO, 8AL, 8AMQ, 8ANJ. 8APB, 8ARW, 8AWX. 8AXC, 8BD, 8CF, 8DP, 8DR, 8DZ. 8FAA, 8FG. 8GB, 8GQ, 8GW, 8HG, 8IK, 8IS, 8JE, 8JQ. 8KK. 8KP. 8LH, 8LY, 8OP, 8QJ, 8RG, 8FQ, 8RW. 8SH, 8SP, 8UO, 8VQ, 8XA, 8XE, 8XH, 8XK, 8XS, 8XU, 8ZA, 8ZD, 8ZE, 8ZL, 8ZR, 8ZT, 8ZV, 8ZW, 8ZY, 8ZZ, 9ASJ, 9AMT, 9AWX, 9DC, 9EQ, 9HY, 9KR, 9LA, 9LQ. 9OX, 9UK, 9UT, 9UU, 9WO, 9WY, 9XF, 9XM, 9YB, 9YI, 9ZD, 9ZJ, 9ZL, 9ZN.

5ZA, LOUIS FALCONI, ROSWELL, N. M.

2RK, 2ZL C.W., 3DH, 4XC, 5AI, 5AO, (5BI), 5BM, 5BO. (5BW), (5CA), 5CC, 5CD, (5CG), (5CI), 5CL, (5DB), (5DD), (5DW), (5EA), (5EF), (5EJ), 5FA, 5FL, 5HA, (5HF), (5HL), (5HV), (5IB), 5IC, (5IF), (5IS), 5JA, (5JE), (5JS), (5JX), 5KA, (5LR), (5MF), 5XA, (5XB spk. and C.W.), (5XD), 5YE, (5YH), (5ZC), 5ZD, (5ZF), (5ZG), 5ZK, (5ZL), (5ZP), (5ZR), 5ZS, (5ZT), (5ZU), 5ZV, (5ZW), (5ZX), (5ZZ), 6AE, (6AK), 6BA, (6BJ), 6BM, (DF), (6DP), (6EB), (6ED), (6EF C.W. & fone), (6EJ), 6EL, (6EN), (6ER), 6FA, 6FI, 6FS, (6GE), 6GF, (6GI), (6HH), (6HY), (6IF), (6IG), (6JD), (6JJ), (6JM), (6JT), (6KA), (6KP), (6MK C.W.), 6MZ, (6OC), (6PQ), (6SK), 6TL, (6TX), (6WH), (6WV), 6XM, (6XZ), (6ZA), (6ZB), 6ZC, 6ZE, (6ZH), 6ZK, (6ZL), (6ZM), (6ZN), (6R), (6AAK), (6ABP), (6ABW), (6ADL), 6AMP, 6ADX, 7CC, (7DA), (7DH), 7EX, 7FL, (7IM), 7IN, 7KX, 7LU, (7YA), (7ZJ), 8ML, 8ZL, 8ZR. (8ZY), 9AK, (9BW C.W. and buzzer), (9CA), 9DU, (9EE), (9EL), (9EQ), (9FB), 9FK, 9FP, (9HI), (9HN), 9HM, (9HT), (9IF), (9JN), (9JQ), (9KV), (9LC), 9KO, 9LE, (9LR), 9LW, 9MS, 9NQ, (9OE), (9OR), (9PI), 9PS, 9PV, 9QM, 9RG, (9RY), (9TI), (9UT), 9UU. (9WI), (9WU), (9WW), 9XI C.W., 9XT, (9XM), 9YA, (9YI), (9YM), (9YW), 9YY, (9ZB), 9ZC, (9ZJ), 9ZL, (9ZN), (9ZT, 9ZG, 9ZL, (9ZV), (9ZX), (9ABX), 9AAJ, 9ABI, 9AED, (9AEG), 9AEP, 9AEQ, 9AEU, 9AEZ, 9AEY, 9ACV, (9AMB), 9AMR, (9AFX), 9ALG, 9AJD, 9AON, 9APC, 9AVQ, (9AUO), NSF C.W. buzzer, fone.

L. W. HATRY, PORT ARTHUR TEXAS—March.

4AG, 4DJ, 4XA fone, 4XC, 4YA, 5CA, 5EK, 5EW, 5FL, 5HL, 5HV, 5IB, 5IF, 5JD, 5JE, 5JI, 5MO, 5MY, 5XA, 5XB C.W. spk., 5YE, 5YH, 5YI, 5ZA, 5ZAA, 5ZAB, 5ZC, 5ZE fone, spk., 5ZF, 5ZL, 5ZP, 5ZR, 5ZS, 5ZT ZZU, 5ZW, 5ZX, 6WV C.W., 8AEE, 8AIO, 8DC, 8EB, 8HG, 8IK, 8KP, 8XK I.C.W., 8YG C.W., 8ZG C.W., 8ZL fone and spk., 8ZY, 9AAC, 9AAG, 9AAW, 9ABL, 9AEG, 9AEQ, 9AEY, 9AFX, 9AHS, 9AIZ, 9ALG, 9ANV, 9ANP, 9AOH, 9AON, 9AOX, 9AP, 9ARJ, 9ARP, 9ATF C.W., 9AVO, 9AV, 9AZN C.W., 9AZX C.W., 9BW, 9CA, 9CP, 9DE, 9DIW, 9DV, 9EL, 9FU, 9HI, 9HM C.W. spk., 9HN, 9HT, 9JA, 9JG, 9JN, 9JQ, 9KF, 9KV, 9LC C.W. and spk., 9LF, 9LR, 9MC, 9NQ, 9OE, 9OX, 9PS. 9PV. 9QO, 9RY, 9TI, 9UF, 9UK, 9UT, 9VZ, 9WI, 9WU, 9XI C.W., 9XM, 9YA, 9YM, 9ZAC, 9ZL, 9ZN, 9ZV, XF1 C.W., NSF I.C.W. and fone.

5JY, DALLAS, TEX.

(5AI), 5AJ, (5AU), 5BV, 5BJ, 5BI, 5BM, (5CE), (5C), (5CI). (5DW), 5EA, 5ER, 5ES. (5EW), 5EL, 5FE, 5FB, 5FA, (5GU), (5HF), 5HU, (5HV), 5IB, 5IC, (5IE), 5IF, (5IH), (5IS), 5JA, 5JD, (5JG), (5JL), (5JU), 5JE, (5KK), (5LC), (5LR), 5LS, (5LT), 5ME, 5MR, 5MC, 5MF, (5MM), (5ML), 5NG. (5NC), 5XA, 5XB, (5XG), 5XJ, 5YH, 5YE, 5ZA, (5ZC), 5ZF, (5ZG C.W. & spk.), 5ZL, 5ZP, 5ZU, 5ZW, 5ZX, 8CO, 8KP, 8HG, 8KK, 8MR, 8AKV, 9AAC, 9AAV, 9AEY, 9AWO, 9AEQ. 9AEG, 9AFX. 9AON, 9AOU, 9BW, 9CA, 9EL, 9FF, 9FU, 9HI, 9HT. 9JA, 9JN, 9LA, 9LR, 9MM, 9NQ, 9OE, 9QO, 9UT, 9WU, 9WN, 9WW, 9XM C.W., 9ZL, 9ZQ.

6QR, RENO, NEVADA.

5ZA, 6AAD, 6AAK, 6AAW, 6ABM, 6ABP, 6ACA, 6ACR, (6ACY), (6ADL), (6ADQ), (6AFN), 6AFW, 6AFY, (6AGF), 6AID, 6AJH, (6AJR), 6AJX, 6AKH, 6ALA, (6ANK), 6AOR, (6AE), (6AH), (6AK), (6AR), 6AT, 6BB C.W., 6BX C.W., (6CH), (6CZ), 6DA, (6DP), (6EA), (6EB), (6ED), (6EF fone & C.W.), 6EJ, (6EN), 6ER, (6EX), 6FH, 6FI. 6FT, 6GI, (6GP), 6GR, 6GY, (6HC) (6HH), 6HY, 6IC, 6ID. (6IF), 6IG, 6IR. (6IS), 6IT C.W., 6IV. 6JI. 6JM. (6JR). 6JT. (6KA), 6KI. 6KL. 6KM, (6KP), (6KS), 6LC, 6LU, 6MH, 6MK, 6MZ,

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(6OC), 6OH, (6OL), 6OT, 6OW, 6PC, 6PQ, 6PR, 6QS, (6QY), (6RN), 6RU), (6SK), (6TL), 6TO, 6TV, 6UK, 6VX, 6WH, (6XZ), (6ZA), (6ZH), 6ZK, 6ZM, (6ZN), (6ZO), 6ZR, (6ZU), (6ZY), (7AD), (7BC), (7BH), (7BJ), 7BK, (7BP), (7BQ), 7CE, (7CU), (7CW), 7DH, (7DS), 7ED), 7EX, (7FI), (7FL), 7GA, 7GI, 7HN, 7ID, (7IN), (7JW), 7JX, 7LN, 7LU, 7LY, 7MB, 7NN, (7YA), 7YS, 7ZG, (7ZI), (7ZJ), (7ZM), 9YW.

RAYMOND ZIMMERMAN, 2318 K ST., SACRAMENTO, CAL.

5ZA, 6AE, 6AF, 6AG, 6AH, 6AJ, 6AK, 6AL, 6AN, 6AO, 6AR, 6AT, 6BA, 6BJ, 6BM, 6BN, 6BP, 6BQ, 6BR, 6CC, 6CF, 6CH, 6CL, 6CO, 6CP, 6CR, 6CV, 6DA, 6DH, 6DK, 6DP, 6DW, 6DY, 6EA, 6EB, 6EC, 6ED, 6EJ, 6EK, 6EN, 6EP, 6ER, 6EX, 6FB, 6FE, 6FH, 6FI, 6FJ, 6FT, 6GF, 6GI, 6GR, 6GX, 6HH, 6HY, 6JA, 6JC, 6JD, 6JI, 6JJ, 6JN, 6JR, 6JT, 6KA, 6KM, 6KP, 6LO, 6LT, 6NC, 6NH, 6NL, 6NY, 6OC, 6OH, 6OL, 6OM, 6OT, 6OW, 6OX, 6PH, 6PJ, 6PM, 6PQ, 6PR, 6QL, 6QN, 6QR, 6RP, 6RQ, 6RT, 6SK, 6SR, 6SU, 6TC, 6TF, 6TV, 6TX, 6UM, 6VQ, 6WG, 6WJ, 6WZ, 6XZ, 6ZA, 6ZB, 6ZH, 6ZJ, 6ZK, 6ZM, 6ZR, 6MZ, 6CZ, 6IC, 6ID, 6IG, 6IK, 6IP, 6IF, 6IR, 6IU, 6TL, 6VM, 6ZO, 6AF, 6IY, 6IQ, 6IL, 6GM, 6SG, 6IM, 6GA, 6DJ, 6TO, 6LL, 6IV, 6GP, 6BH, 6AAB, 6GH, 6AAF, 6AAG, 6AAK, 6AAJ, 6AAM, 6AAT, 6AAW, 6ABK, 6ABM, 6ABP, 6ABT, 6ABW, 6ABX, 6ACA, 6ACB, 6ACF, 6ACL, 6ACM, 6ACP, 6ACW, 6ACY, 6ADL, 6ALW, 6AEA, 6AFN, 6AFD, 6AGA, 6AGF, 6AGP, 6AIL, 6AIM, 6AIN, 6AIW, 6AJH, 6AJT, 6ADA, 6ADX, 7AD, 7DA, 7CU, 7CC, 7CW, 7IN, 7BP, 7GO, 7GY, 7BQ, 7ZI, 7DF, 7ED, 7CQ, 7HN, 7IU, 7ZJ, 7DQ, 7YA, 7BA, 7ZH, 7LW, 7HS, 7BH, 7LU, 7CN, 7EX, 7GA, 7HD, 7CE, 7KB, 7LN, 7BJ, 7BR, 7DH, 7FB, 7BK, 7DS, 7ZK, 7GK, 7BC, 7FH, 7FI, 7IX, 7LY, 7FL, 7KX.

6BF, SANTA PAULA, CAL.

5EA, 5IF, 5ZA, 6AAH, 6AAK, 6AAT, 6AAY, 6ABM, 6AC, 6ACA, 6ACM, 6ACR, 6ACS, 6ACY, 6ADA, 6ADU, 6AE, 6AEF, 6AER, 6AEW, 6AF, 6AFN, 6AFU, 6AGC, 6AGF, 6AGH, 6AHB, 6AHQ, 6AID, 6AIK, 6AIL, 6AIT, 6AIW, 6AJT, 6AJV, 6AK, 6ALU, 6AOM, 6AR, 6AT, 6AY, 6BX C.W., 6CC, 6DD, 6DF, 6DK, 6DP, 6DR, 6EA, 6EB, 6EC, 6ED, 6EF, 6EJ, 6EN, 6EP, 6ER, 6EW, 6EX, 6FH, 6FI, 6FR, 6FS, 6GP, 6GR, 6GY, 6HH, 6HX, 6IF, 6IY C.W., 6IZ, 6JD, 6JE, 6JF, 6JM, 6JT, 6KA, 6KI, 6KM, 6KN, 6LC, 6LE, 6LT, 6LX, 6MK, 6MZ, 6OC, 6OH, 6OL, 6OP, 6OW, 6PE, 6PQ, 6PR, 6QR, 6QS, 6SK, 6TC, 6TG, 6TH, 6TV, (6VZ), 6XZ, 6ZA, 6ZE, 6ZH, 6ZK, 6ZN, 6ZR, 6ZS, 6ZT, 6ZU, 6ZX, 6ZY, 7FI, 7HN, 7IN, 7ZG.

6AE, STANFORD UNIVERSITY, CAL.

5ZA, 6ADL, 6AID, 6EB, (6ED), 6EN, 6ER, 6GP, (6ID), (6IG), (6IS), 6JT, (6KA), 6OT, 6PR, 6QR, (6RN), 6XZ, (6ZA), 6ZH, 6ZM, (6ZN), 7BC, 7BJ, 7BK, 7BP, 7BQ, 7DH, 7FI, 7FL, 7IN, (7LN), (7YA), 7YS, 7ZK, 7ZJ, 9YW, Canadian 5BA.

6ED, SANTA ANA, CAL.

5IF, (5ZA), (6AE), 6AH), (6AK), (6AN), (6AR), (6AS), 6AT, 6BB, 6BJ, 6BN, 6BQ, (6BX), 6CO, (6CP), 6CS, (6CV), (6DK), 6DH, 6DP, (6EJ), (6EX), (6FH), 6FI, 6FN, (6HH), (6IC), 6IV, 6IY, (6JJ), (6JR), (6JT), (6KL), (6MZ), (6NH), (6OC), (6OH), 6OT, (6OW), (6PR), (6PW,) (6QR), (6QS), 6WZ, 6XW, (6XZ), 6ZA, (6ZB), 6ZE, (6ZH), (6ZK), 6ZM, (6ZN), (6ZO), 6ZR, 6AAB, 6AAK, (6ACM), (6ACR), (6AGF), (6AJT), (6AJH), 6AIK, 6AIW, 7AD, 7AF, (7BT), 7BK, (7BP), 7GI, (7BQ), (7CC), 7CE, (7CU), 7CW, 7DA, 7DK, (7DS), (7ED), 7EX, 7FL, 7FI, 7FN, 7FX, 7GO, 7YA, 7YB, 7ZB, 7ZG, (7ZI), 7ZR, 7IM, (7IN), (7ZJ), 7FX, 9AEQ, 9WU, 9OE, 9RR (?) 9YW, 9ZN.

6VS, OGDEN, UTAH,—February.

5ZA, 6AD, 6AH, 6AK, 6AN, 6AT, 6BA C.W., 6BQ, 6CV, 6DK, 6DP, 6DW, 6EA, 6EB, 6ED, 6EJ, 6EN, 6ER, 6GF, 6HH, 6IF, 6IG, 6JD, 6JJ, 6JR, (6JT), 6KP, (KDEH), 6MK, 6NQ, 6OH, (6OT), 6PE, 6PQ, 6PR, 6QR, 6SJ, 6UK, 6XZ, (6ZA), (6ZH), 6ZK, (6ZM), 6ZN, 6ZP, 6ZR, 6ZS, 6ZU, 6ZX, 6ABM, 6ABP, 6ACA, 6ACD, 6ACR, 6AFN, 6AFD, 6AGF, 6AIL, 6AIW, 6AJT, 7AD, 7AN, 7BC, 7BK, 7BP, 7BQ, 7BR, 7CC, 7CU, 7CW, 7DA, (7DH), 7DR, 7DS, 7DV, 7EX, 7FB, 7FH, 7FI, 7GA, 7GQ, 7IF, 7IM, 7IN, 7JR, 7KK, (7KX), 7LB, 7LN, 7LU, 7LW, 7LY, 7MO, 7MB, 7OH, 7XB, 7YA, 7ZA, 7ZG, 7ZH, 7ZI, 7ZJ, 9EL, 9HI, 9IF, 9LW, 9PI, 9QO, 9UT, 9WI, 9YW, 9ABX, 9AID, 9AIF, 9ASF, 9DCG.

7HN, EUGENE, OREGON.—Feb. to March 11.

6AN, 6AK, 6EC, 6EA, 6CO, 6CU, 6DP, 6ER, 6EJ, 6FI, (6FH), 6GF, 6GN, 6GU, 6IC, 6ID, 6IF, 6IK, 6IY, 6GP, 6JM, 6KM, 6LK, 6MZ, 6OC, 6OH, 6OW, 6KP, 6PR, 6QS, 6TC, 6VX, 6ZK, 6ZH, 6ZR, 6AAE, 6AAD, 6AAK, 6ACA, 6AID, 6AAW, 6AFN, 6AFM, (6AGF), 7AD, 7BC, 7BK, 7BQ, 7CB, 7CC, 7CW, 7I, 7FL (7IY), 7IU, 7LU, 7LS, 7YS, 7IN.

7LN NAMPA, IDAHO.

5IF, 5ZA, 6AC, (6AE), 6AK, 6BX C.W., 6CV, 6DD, 6DH, 6DK, 6DM, 6DO, (6DP), 6EA, 6EB, 6ED, 6EJ, 6EN, 6ER, 6EX, 6FH, (6GF), 6GY, 6HH, (6IC), 6IG, 6IV, 6IY C.W., 6JM, 6JR, 6KA, 6KM, 6LA, 6LB, 6LC, 6LH, 6LK, 6LR, 6LT, 6LX, 6MK, 6MZ, 6OH, 6OW, 6PO, (6PR), 6QR, 6RN, 6SK, 6TC, 6TO, 6UK, 6UM, 6VH, 6WV C.W., 6XL, 6ZA, 6ZB fone, 6ZH, 6ZK, (6ZP), 6ZR, 6ZS, (6ZU), 6ZX, 6Y, 6AAK, 6ABM, 6ABP, 6ABX, 6ACA, 6ACD, 6ACR, 6ADA, 6ADL, 6AFN, 6AGF, 6AGU, 6AID, 6AJT, 6AJK, 6AOM, 7AD, 7BC, 7BH, 7BJ, 7BK, (7BP), 7BQ, 7BZ, 7CB, 7CM, 7CU, 7CW, (7ED), 7EX, 7FG, 7FI, 7FL, 7FO, (7FT), 7GA, 7GI, (7HJ), 7HS, 7IN, 7IY, 7JR, 7KX, 7LM, 7LU, 7LY, 7NN, 7OF, 7XB, (7YA), 7YS, (7ZG), 7ZI, (7ZJ), 7ZK, 7ZM, 9BW, 9EE, 9EL, 9LR, 9LW, 9PI, 9WI, 9WU, 9WV, 9AFJ, 9AFX, 9AID, 9AIW, 9ARJ, 9ASR, 9AWD, 9XAE.

CHAS. F. BURDICK, CASPER, WYO.

5BM, 5EW, 5HD, 5HF, 5HI, 5IB, 5IF, 5IT, 5JS, 5ZA, 6AJX, 6EF, 6EJ, 6IG, 6PU, 6SK, 6VS, 6ZB, 6ZH, 6ZK, 6ZU, 7DH, 7EX, 7FI, 7HS, 7KX, 7LY, 7MO, 7YA, 7ZG, 7ZN, 9AAG, 9AEG, 9AEY, 9AFX, 9AOH, 9AON, 9AOO, 9ASF, 9AUO, 9AVZ, 9BW, 9DB, 9DO, 9DCE, 9DCG, 9DGP, 9DIW, 9DJD, 9EL, 9ET, 9HI, 9HM, 9HN, 9JN, 9LR, 9LW, 9OE, 9PS, 9QO, 9RY, 9SZ, 9TI, 9UT, 9WI, 9WU, 9VAE, 9XL, 9XO, 9ZC, 9ZN, 9ZO.

8GX, OBERLIN, OHIO.

1AW, 1BZ, 1CK, 1OE, 1PG, 1TS, 1XM, 1BAB, 1BBD, 1BBL, (1GBT), (1HAA), 1RAY, (2BK), (2DA), (2DN), 2FG, 2EL, (2JU), (2OA), 2OM, 2PL, 2SZ, (2AER), (2ARD), (2BGH), (3BP), 3BZ, (3DH), 3EN, 3GN, (3GO), (3HJ), (3HG), (3IW), (3KM), 3NB, (3PU), (3VV), (3XF), 3XM, 3ZP, 3AHK, Can (3DH), (3EI), (3BP), (4AG), (4XC), 4YB, 5DA, 5EA, 5JD, 5JE, 5LO, 5SV, 5XA, 5YE, (5YH), 5ZA, 5ZC, 5ZE, 5ZP, 5ZAB, 6KA, 8AY, (8BU), (8CD), 8FE, 8FI, 8FT, 8GW, 8HA, 8HG, 8IB, (8ID), (8IN), (8IZ), 8IW (8JL), (8JP), (8KK), (8KM), (8LM), (8LQ), (8ML), (8RB), (8R), (8RU), (8TN), 8TW, (8TY), 8UK, (8VS), (8WV), 8XE, 8XK, 8XU, 8ZA, 8ZB, 8ZD, 8ZL, 8ZN, (8ZR), 8ZT, 8ZW, 8ZY, 8AAT, 8ABZ, 8AGK, 8AHR, 8AIO, 8AKV, 8AMP, 8AMW, (8AMZ), 8AXC, 8AYL, 8AYN, 8BBC, 8BBW, 9AC, 9AK, 9AV, (9CA), (9CP), (9DC), (9DV), 9EE, (9FF), (9FU), 9GP, 9HI, 9HM, 8HT, 9HY, (9JN), (9KB), 9KF, (9KL), 9KN, 9LA, (9LC), (9LQ), 9LR, 9MS, 9NQ, 9OO, (9OE), (9OX), (9PS), (9PV), (9QJ), 9QO, (9UH), 9UT, (9UU), 9VC, 9WU, 9XA, 9XM, 9YM, (9ZB), 9ZJ, 9ZL, (9ZN), (9AAC), (9AAV), (9AAW), 9ABL, 9ACJ, 9AEG, 9AEQ, 9AEY, (9AFX), 9AGK, (9AHO), 9AJH, (9ANV), (9AOH), 9AOK, (9ARG), (9AWZ), 9DCW, (9DGP).

8NB, ROCHESTER, N. Y.

1CK, 1CY, 1CZ, 1DY, 1GB, 1IA, 1OE, 1OZ, 1QP, 1QR C.W., 1RZ C.W. & spk., 1TS, 1XM C.W., 1YB, 1BBL, 1GAN, 1GBC, 1GBT, 1HAA, 1HAF, 1IAP, 1MAD, 1MAU, 1RAD, 1RAS, 1RAY, 1SBZ, 2AK, 2AR, 2BG, 2BK, 2BM, 2CT, 2DA, 2DI, 2DN, 2DR, 2DS, 2EB, 2EL, 2FG, 2HI C.W., 2JR, 2JU, 2KX C.W., 2NQ, 2OA, 2OE, 2PL, 2RK, 2RL, 2RM, 2SZ, 2UK, 2XK C.W., 2XQ, 2XX C.W. & fone, 2ZC, 2ZL C.W., 2ZM C.W. & spk., 2AER, 2AID,

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2ALD, 2ARD, 2AXB C.W., 2BML C.W., 3BP, 8CC, 3DH, 3DP, 3EN, 3FB, 3GO, 3HG, 3HJ, 3NB, 3OU, 3PU, 3XF, 3XM, 3YK, 3AIC, 4CB, 5DA, 5ER, 7CC, 8AL, 8AT, 8BQ, 8BV, 8CD, 8CG, 8DR, 8DV C.W. & spk., 8DZ, 8ED, 8FE, 8FM, 8FQ, 8HJ, 8HP, 8HR, 8ID, 8IK, 8IL, 8IN, 8JQ, 8JU C.W., 8KP, 8KZ, 8LF, 8LQ, 8ML, 8MM, 8MT, 8PI, 8PN, 8PQ, 8PW, 8QR, 8RQ, 8RU, 8RW, 8SH, 8SP, 8TK, 8TN, 8TY, 8VQ, 8WY, 8XE, 8XK C.W. & fone, 8XS, 8XU, 8ZA, 8ZD, 8ZL, 8ZT, 8ZW, 8ACF, 8ADR, 8AFZ, 8AGK, 8AHU, 8AIO, 8AMZ, 8AND, 8ANJ, 8AOT, 8APB, 8ARW, 8AXC, 9AV, 9GP, 9HJ, 9JN, 9KF, 9KV, 9LQ, 9MT, 9OE, 9TV, 9UH, 9YB, 9YI, 9ZL, 9AWZ, 9BBL, NSF C.W. & fone, XF1 C.W., XK1 C.W., WL8, NAI.

8ZG, SALEM, OHIO.—All C.W.

Heard at 8ZG: 1AE, 1QR, 1XM, 1XX, 2CS, 2AJF, 2XE, 2XF, 2XK, 2AXB, 2BB, 2ZM, 3AAO, 3MBL, 4ZB, 4GL, 8IK, 8DR, 8ALY, 8KM, 8ACC, 8LF, 8PJ, 8IB, 8ZL C.W. and voice, 8ZW, 8YG, 9YM, 9ZT, 9AZX, XF1, XB1, NQT, KDKA. 8ZG worked following C.W. stations: 1RU, 2ZL, 3AAE, 8AGZ, 8IB, 8UK, 8VS, 8IB, 9XI, 9XM, 9ATF, NSF. Handled 68 msgs. during March. Longest distance—700 miles, 9XI. (on 10 watts).

8EB, NORWOOD, CINCINNATI.

1AIA, 1AW, 1BBL, 1HAA, 1QN, 1XF, 1XM, 1YB, 2AHK, 2ALN, 2DI, 2DN, 2DR, (2EL), 2EN, 2OU, 2QR, 2RK, 2SZ, 22XX, 3AL, 3BP Canada, 3DH, 3EN, 3GO, (3HG), (3HJ), 3JW, 3KM, 3NB, 3XF, 4AG, 4BY, 4KA, 4XC, 4YA, 4YB, 5DA, 5HL, 5IF, 5JD, (5XA), 5YH, 5ZD, 5ZE, 5ZL, 5ZK, 5ZO, 8AAV, 8AL, 8ADE, (8AGK), 8AGO, 8AIB, 8AKJ, 8AN, 8ANJ, 8AOA, 8ARK, 8ASU, 8BC, 8BF, (8BO), 8BQ, 8BV, 8CD, 8CF, 8CG, 8CV, 8FQ, 8HR, 8IB, 8ID, 8IK, 8JE, (8JJ), 8JL, 8KK, 8KM, 8KZ, 8LH, 8LV, 8MF, 8MM, 8NG, 8NI, 8OI, (8OJ), 8PM, 8QA, (8RQ), 8RU, 8SP, 8TT, (8UK), 8WY, 8XE, 8ZK, 8XS, 8XU, 8YI, 8YN, 8ZD, 8ZN, 8ZR, 9AAG, 9AAW, (9ABL), 9ABZ, 9ACB, 9ACJ, 9ADS, 9AGK, (9ANV), 9AON, 9AOX, 9AP, 9AR, 9ARO, 9AV, 9AWX, 9AWZ, 9BP, 9CA, 9DB, 9DDW, 9DIW, 9DV, 9DW, (9EL), 9EZ, 9FG, 9GP, 9HI, 9HM, 9HN, 9HT, 9JD, 9JQ, 9KF, 9KN, 9KO, 9KV, 9LF, 9LQ, 9LU, 9LR, 9LW, 9MC, 9MS, 9NO, 9NQ, 9OE, 9OO, 9PN, 9PV, 9QJ, 9RY, 9TI, 9TV, (9UF), (9UU), 9VC, 9VF, 9WI, 9WW, 9XI, 9XM, 9ZB, 9ZJ, 9ZN, 9ZV.

8XN, PITTSBURGH, PA.

1AR, 1AT, 1AW, 1BM, 1HAA, 1KN, 1OE, 1QR, 1XM, 2AQ, 2ACM, 2BK, 2CC, 2GO, 2GR, 2GY, 2NC, 2RK, 2WP., 2XM, 2ZL, 2ZR, 3AW, 3AIC, 3CC, 3EN, 3HG, 3NV, 3MI, 3OU, 3XF, 3YK, 4KC, 8AL, 8AP, 8AAJ, 8AAL, 8ABG, 8ABH, 8ACF, 8ACP, 8ACQ, 8AEE, 8AGD, 8AGK, 8AGX, 8AGY, 8AHL, 8AHZ, 8AIF, 8AIN, 8AIO, 8AIU, 8AIV, 8AIX, 8AJC, 8AJM, 8AJT, 8AJW, 8ALD, 8ALV, 8AMM, 8AMQ, 8AMZ, 8ANJ, 8ANZ, 8AOI, 8AOO, 8AOP, 8AOW, 8ARA, 8ARU, 8ASF, 8ATS, 8ATX, 8AWA, 8AXV, 8CI, 8CF, 8CG, 8CU, 8CW, 8DC, 8DQ, 8DR, 8DZ, 8EA, 8ED, 8EH, 8EW, 8FQ, 8FM, 8GI, 8HC, 8HS, 8IN, 8IIQ, 8JQ, 8KI, 8KQ, 8KP, 8LF, 8LH, 8LX, 8MD, 8ML, 8NI, 8NN, NT. 8NV, 8OC, 8OO, 8OW, 8PA, 8PL, 8QE, 8QQ, 8RP, 8RQ, 8RU, 8RV, 8SG, 8UK, 8UP, 8UQ, 8VQ, 8VX, 8WD, 8WS, 8XC, 8XH, 8XK, 8XM, 8XU, 8YI, 8ZD, 8ZQ, 8ZR, 8ZV, 8ZZ, 9AP, 9AAW, 9ANV, 9AOH, 9DF, 9ET, 9GP, 9KF, 9KR, 9LQ, 9QR, 9NW, 9UK, 9WE, 9ZN.

8AWX, HIRAM, OHIO.

1AW, 1HAA, 7MA, 1QR, C.W., 1XR, 1XF C.W., 2BB, 2BM, 2FK, 2JU, 2OE, 2OM, 2QB, 2RK, 2SZ, 2TJ, 2UK, 2ZD C.W., 2ZL C.W., 2ZM, (3AD), 3BG, 3BP, 3BQ, 3BZ, 3DH, 3EL, 3EN, 3FK, (3GO), 3HB, (3HG), 3KM, 3NB, 3OU, 3PU, 3XC, 3XF, 3XQ, 3YE, 3YK, 3YV, 4AL, 4CK 4XC, 4YB, 5YD, 5YE, eights too numerous, 9AAF, 9AAW, 9ABL, 9AHO, 9ALS, (9ANV), 9AON, 9AOX, 9AP, 9ARK, 9AWX, 9CP, 9DBE, (9DV), 9ET, 9FI, (9GN), 9GP, 9HI, 9HM, 9HN, 9HR, 9IP, 9JA, 9JN, 9JT, 9KF, 9KO, 9KP, 9KR, 9KV, 9LA C.W., (9LQ), 9LR, 9MC, 9MH., 9OE, (9OX), 9QN, 9QO, 9UF, 9UH, 9UK, (9VC), 9WE, 9WW, 9ZB, 9ZJ, 9ZN, 9ZO, 9ZV.

9AHC, ELLENDALE, N. D.

2RK, 4XC, 5DW, 5HL, 5HV, 5IB, 5IF, 5JD, 5JR, 5JS, 5YH, 5ZA, 5ZC, 6AAM, 6AJX, 6ED, 6GP, 6IG, 6JT, 6TH, 6WV, 6ZH, 6ZX, 6BQ, 7DH, 7EX, 7FI, 7FL, 7HS, 7KX, 7LU, 7LY, 7MO, 7ZG, 7ZM, 8BO, 8CD, 8CF, 8CG, 8DC, 8DP, 8DR, 8DZ, 8FG, 8FT, 8GC, 8IB, 8ID, 8IK, 8IP, 8JJ, 8JM, 8KM, 8KP, 8LQ, 8LU, 8NI, 8NZ, 8OJ 8QJ, 8TT, 8VY, 8XC, 8XK, 8XS, 8YG, 8ZA, 8ZL, 8ZR, 8AAK, 8ACC, 8ADE, 8AGK, 8AIB, 8AIO, 8ALY, 8ANA, 8AOI, 8AYF, 9AAC, 9AAE, 9AAF, 9AAG, 9AAJ, 9AAO, 9AAP, 9AAW, 9ABH, 9ACD, 9ACL, 9ACN, 9AEG, 9AEJ, 9AEN, 9AEQ, 9AEY, 9AFO, 9AFX, 9AGN, 9AHO, 9AHS, 9AHZ, 9AID, 9AIF, 9AIS, 9AIY, 9AIZ, 9AJI, 9AJN, 9AJS, 9AKC, 9AKX, 9ALG, 9ALH, 9ALK, 9ALO, 9ALS, 9AMQ, 9AMS, 9ANF, 9ANP, 9ANV, 9AOH, 9AOJ, 9AON, 9AOU, 9AOX, 9AP, 9APQ, 9ARJ, 9ARX, 9ASF, 9ASK, 9ASL, 9ATO, 9ATV, 9AUO, 9AUU, 9AVS, 9AWG, 9AWK, 9AWX, 9AWZ, 9AXU, 9AYE, 9AYS, 9AYU, 9AYW, 9BM, 9T, 9BW, 8CP, 9CS, 9DAT, 9DBT, 9DBU, 9DCG, 9DCN, 9DCO, 9DDS,(9DE, 9DF, 9DFC, 9DFT, 9DGP, 9DIW, 9DKS, 9DO, 9DV, 9EC, 9EI, 9EL, 9EQ, 9ET, 9EW, 9FF, 9FG, 9FJ, 9FN, 9FQ, 9FX, 9GC, 9GP, 9GY, 9HI, 9HK, 9HM, 9HN, 9HT, 9IF, 9II, 9IY, 9JA, 9JK, 9JL, 9JN, 9JQ, 9KA, 9KF, 9KK, 9KL, 9KO, 9KR, 9KS, 9LC, 9LF, 9LQ, 9LR, 9LW, 9MC, 9ME, 9MH, 9MS, 9NQ, 9NR, 9OE, 9OM, 9OO, 9OX, 9PN, 9PS, 9PV, 9QP, 9QR, 9RG, 9RY, 9SQ, 9TH, 9TI, 9TV 9TW, 9UK, 9UT, 9UU, 9UV, 9UY, 9VB, 9VC, 9VE, 9VR, 9WC, 9WI, 9WW, 9XXAE, 9XI, 9XL, 9XT, 9YA, 9YAC, 9YI, 9YM, 9YW, 9ZB, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZQ, WC1, WL2.

9OE, WICHITA, KANS.

2BK, 2RK, 3FT, (3IW), 3NB, 4AG, 4YA, (4XC), 4XB C.W., 5BM, (5DW), 5EA, 5EJ, 5EK, (5ER), 5ES, (5EW), 5GR, 5HL, (5HV), 5IB, (5IF), (5IS), (5JD), (5LR), 5MX, (5XA), (5XB), 5YE, (5YH), (5ZA), 5ZC, 5ZD, 5ZG, 5ZF, (5ZS), 5ZT, 5ZU, (5ZW), 5ZX, 5ZAA, 5ZAB, (6EN), 6IB, (6IG), (6JT), (6KA), (6WV C.W. & fone), 7BP, 7DH, 7EX, (7LU), (7KX), (7YA), (7ZG), 8AE, 8BO, 8CF, (8DC), (8FT), 8GB, (8GX), 8HA, 8HG, 8ID, (8IK), 8JJ, 8JL, (8KP), 8KM C.W., 8MH, (8ML), 8MM, 8MR, 8NI, 8OJ, 8QJ, 8RI, (8RQ), 8RU, (8TN), 8UY, 8VJ, (8VS C.W.), 8YN, 8ZL spk. & fone), (8ZN), (8ZY), (8AEE), (8ACF), 8AFS, 8AGD, 8AIB, 8AIO, 8AKV, 8AMV, 8ARS, (NSF C.W. & fone), WWV C.W., 9XI C.W., (9XM C.W. & fone), 9's too numerous.

9DIN, MINNEAPOLIS, MINN.

(9ABD), 9ARJ, 9ACV, 9ACK, (9ACD), 9AEQ, 9 AFX, (9AFA), 9AGC, 9AHL, (9AJP), (9AJL), 9AJQ, 9AKU, 9AMH, 9AMC, 9AMI, 9AMU, (9ANP), (9APV), 9APN, (9AQV), (9AQT), (AQN), 9ARL, 9ASC, (9ASL), 9ASN, 9ASQ, 9ATM, (9TV), (9AUL), 9AWL, (9AWS), 9AXU, 9AXW, (9AYO), 9AYG, 9AZN, 9BT, 9BP, 9BR, 9BV, 9BF, 9CZ, 9CT, 9DGM, 9DM, 9DDG, (9DDL), 9DX, 9AL, (9DIH fone), (9DGV), (9DR), 9DQ, (9DFU), (9DHS), 9DG, 9DA, 9DK, (9DOK), 9DP, 9DL, 9EE, 9FB, 9FK, 9FP, 9FC fone, 9GC, 9GD, 9GZ, 9GN, 9HL, (9HM), 9HK, 9HT, 9HC, 9IP, 9IO, 9IQ, 9IZ, 9JL, 9JI, 9JH, 9KL, 9KV, 9KS, 9KK, 9KN, 9LR, 9LM, 9LT, 9MD, 9MS, (9MB), 9MC, 9MI, 9MO, 9MZ, 9NL, 9NA, 9NC, 9NK, 9NR, 9ON, 9OE, 9OI, 9PA, 9PC, 9PB, 9AN, 9ST, (9SV), 9SN, 9SU, 9SL, 9SK, 9TT, 9TS, 9TW, 9TI, 9UU 9WS, (9WM), (9XD C.W. & fone, 9XM C.W. & fone, 9XL, 9XO, 9YI, 9YW, 9YL, 9ZB, 9ZV, 9ZU fone, (9ZT), 9ZW, 9ZR, 9ZG, 9ZY, 8AFD, 8ALV, 8CL, 8CV, 8CF, 8IK, 8LM, 8LN, 8MJ, 8NN, 8OI, 8QJ, 8QR, 8QL, 8RS, 8VL, 8UU, 8ZK, 8ZW fone, 7AM, 7CT, 7FL, 7EX, 7GC, 7KV, 7PV, 7PT, 7TK, 6LT, 6RA, 55AR, 5FT, 5JS, 5OS, 5OL, 5RS, 3AL, 2RK, 2JJ, 2DL, 1AL, 1HAA.

COLO. WIRELESS ASS'N. (Y.M.C.A.), DENVER.

5BH, 5BI, 5EJ, 5EX, 5FL, 5HK, 5IF, 5JG, 5XB, 5XD, 5YH, 5ZA, 5ZC, 5ZM, 5ZU, 5ZZ, 6AK, 6EA 6EJ, 6FS, 6IG, 6JD, 6XZ, 6ZA, 6ZD, 6ZH, 6ZM, 7DM, 7EX, 7IM, 7KX, 7YA, 7ZG, 7ZH, 9BW, 9CU, 9EE, 9EL, 9HT, 9IF, 9JN, 9JQ, 9KQ, 9KV, 9LA, 9LR, 9LW, 9OE, 9PS, 9VF, 9WU, 9YI, 9YM, 9YN, 9YW, 9YY, 9XI, 9XL, 9XM, 9ZL, 9ZN, 9ZV,

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9ZX, 9AAC, 9AEG, 9AEQ, 9AEY, 9AJI, 9ARJ, 9DIJ.

9FD, LAFAYETTE, INDIANA.

NSF, 1AW, 2AF, 2AH, 2BK, 2DA, 2DN, 2DR, 2EL, 2FJ, 2GO, 2RK, 2ZL, 3AMP, 3BP, 3BZ, 3DH, 3FJ, 3GO, 3HG, 3HJ, 3HX, 3NC, 3RJ, 3YE, 3ZA, 4TLE, 4AG, 4BA, 4DP, 4EX, 4FD, 4GN, 4XB, 4XC, 4YA, 5BY, 5DA, 5EK, 5ER, 5IB, 5JD, 5LX, 5XA, 5YH, 5ZL, 5ZS, 7HS, 8AAD, 8AAL, 8AAZ, 8ACF, 8AFB, 8AGD, 8AGK, 8AIO, 8AMQ, 8AXC, 8AWX, 8ICO, 8IDF, 8IIZ, 8LIM, 8PTE, 8USZ, 8UYE, 8AA, 8AE, 8AF, 8AG, 8AI, 8AL, 8AR, 8BA, 8BQ, 8CE, 8DJ, 8DP, 8DR, 8FI, 8FM, 8IB, 8ID, 8IK, 8IL, 8IN, 8JE, 8KP, 8KR, 8LC, 8MF, 8MM, 8MY, 8OM, 8RU, 8SV, 8TE, 8TN, 8TT, 8VJ, 8WR, 8WY, 8XA, 8XE, 8XM, 8XR, 8XW, 8ZA, 8ZD, 8ZG, 8ZL, 8ZM, 8ZN, 8ZR, 8ZV, 8ZW, 8ZY, 9AAC, 9AAF, 9AAW, 9AAZ, 9ABL, 9ACB, 9ACE, 9ACB, 8ACU, 9ACL, 9ADN, 9ADX, 9AEC, 9AEG, 9AFO, 9AGR, 9AHI, 9AMH, 9ANV, 9AOH, 9AQE, 9AQG, 9ARK, 9ASL, 9AST, 9AUC, 9AWG, 9AWR, 9AWV, 9AXE, 9AYH, 9AZE, 9AZX, 9CAF, 9DBX, 9DCN, 9DCU, 9DEN, 9DGX, 9DHZ, 9DIW, 9DKT, 9EON, 9FDH, 9KXR, 9MAJ, 9MAO, 9STZ, 9TQZ, 9WAA, 9ZAC, 9AA, 9AP, 9BW, 9CA, 9CP, 9CR, 9DB, 9DC, 9DF, 9DK, 9DV, 9EC, 9FF, 9FH, 9FK, 9FR, 9FN, 9GU, 9HT, 9HM, 9HN, 9HV, 9II, 9JL, 9JM, 9JQ, 9KA, 9KC, 9KF, 9KL, 9KR, 9KX, 9LA, 9LL, 9LO, 9LP, 9MC, 9MF, 9MU, 9MY, 9OE, 9OO, 9OX, 9PE, 9PP, 9QH, 9QJ, 9QO, 9QR, 9RL, 9SP, 9SQ, 9UJ, 9UK, 9UO, 9UQ, 9UW, 9VC, 9WE, 9WO, 9WW, 9XM, 9XT, 9XW, 9YA, 9YB, 9YC, 9YQ, 9YW, 9ZC, 9ZE, 9ZJ, 9ZL, 9ZQ.

9DCO, LAWRENCE, KANSAS.

5BM, 5HK, 5HV, 5IF, 5LA, 5SF, 5YE, 5YS, 5YW, 5ZA, 5ZE, 6LR, 8AP, 8ARK, 8QJ, 8ZR, 8ZV, 9ACN, 9AEG, 9AEQ, 9AJN, (9AHZ), 9AMS, 9AON, (9AQE), (9ARP), 9AWU, 9AWX, 9BM, (9BT), 9BW, 9DN, 9DU, 9DBS, 9DIW, (9EL), 9GN, (9HI), 9HN, 9JN, 9KD, 9KI, 9KY, 9LE, 9LL, 9LQ, 9LR, 9MC, 9NQ, 9OE, 9OO, 9PS, 9QL, (9QO), 9QT, 9RB, (9RY), 9RU, 9SZ, 9TH, 9UT, (9WI), 9YB, 9YI, 9YM, 9YO, 9YW, 9ZA, (9ZH), 9ZL, 9ZN, 9ZQ, 9ZV, 9ZY, 9ZZ.

9KF, CHICAGO.

1XM, (2AR), (2ARK), 2XQ radiophone, 2ZL C.W., (8DH), (8NB), 8XF, (8XM), 8XU, 8YK, 4XB, 4XC C.W., 4YB, 5AL, 5DO, 5HL, 5IB, 5IS, 5JD, 5TW, 5YH, 5ZC, 5ZD, 5ZAB, 8AW, 8AEE, (8ACF), 8AGD, (8AGK 255 cycle), 8AGO, 9ANJ, 8ARS, 8ARW, (8BB), 8BO, (8CD), 8CP, (8DZ), 8EB, 8EL, (8FI), (8FT), 8GI, 9GX, 8HI, 8IB C.W., 8ID, (8IK), (8JL), 8LQ, 8LV, 8MM, 8NZ, 8QE, (8RQ), (8RU), (8TN), 8TT, 8VS C.W., 8WA, 8XK C.W., 8XU, (8YN), (8ZA), (8ZD), 8ZG C.W., (8ZL), 8ZT, 8ZW, (8ZY), 8ZX, 9AP, 9AAC, (9AAP), 9ABZ, 9ACB, 9ACN, 9AHZ, (9AHO), (9AIP), (9AIY), 9AJN, 9AKC, (9AMQ), 9ANV, (9AON), 9AOH, (9AQT), 9ARJ, 9AWW, 9AWX, 9AXE C.W., 9AYE, 9CA, 9DIW, 9EQ, 9FS, (9FQ), (9GP), 9HM, 9HN, (9JN), 9KL, 9KO, (9KY), (9LF), 9LR, 9NQ, (9OE), 9OO, 9OX, 9PS, 9QJ, (9QO), 9QR, (9TII), 9UH, 9UU, 9UW, 9VC, 9WE, 9WU, 9XI C.W., 9XM C.W. and radiophone, 9YB, (9YI), (9YM), (9YAD), (9ZB), (9ZJ), 9ZV.

F. Clifford Estey

(*Concluded from page 73*)

and '12 he operated at the "Evening News" station at Salem as manager and chief operator. This old station, "FBD", always sent the baseball and football dope, and during its day sent out many an interesting story of the world's series baseball games. The old timers remember this station for the speed and accuracy of its operators.

By trade Estey is really a mechanic and not a salesman. After serving a four-year apprenticeship in mechanics he had a year at tool-making and a year at die-making, gradually working up to assistant foreman, foreman, department manager, and finally factory superintendent and production manager of the Dalton Electric Heating Appliance Co. During the war he was with the General Electric Co. at Lynn on the development of special instruments, and instructing draft army classes in wireless at Beverly of evenings. In May, 1920, he was elected president of the Essex County Radio Association and was the originator of the plan inaugurated there whereby the club became truly a County Association with sections in every city in the county and a prodigious total membership. Under his extremely energetic leadership the club has prospered and has become known as one of the most active organizations in New England with "something doing all the time." Mr. Estey has clear-cut and progressive views in club activities, and has been much sought as a speaker on radio club organization. About a year ago his abilities came to the attention of the American Radio & Reasearch Corpn. and he became a member of the Amrad sales force, traveling the length and breadth of the country giving talks on club work, promoting organized amateur activity, and incidentally increasing Amrad sales.

With the removal of the Amrad offices to Medford Hillside, Mr. Estey has become manager of their Sales Division, succeeding Mr. G. Kenneth Thompson, and so is again located in Salem, where plans have been made for the construction of a new amateur DX station that give great promise for the decrease of the difficulties now experienced in getting western traffic into Boston.

Don I. Bailey

(*Continued from page 37*)

of Brandes Superior phones, two Ferron detectors, two buzzers, two keys, 2 ½" spark coils and two pint Leyden jars. He then visited Woolworth's and purchased a rolling pin, then ordered some wire and sliders, and got started on his career as an Amateur Radio Operator. After he got his little rolling pin tuner and ½" coil going he could hear lots of stations but was unable to get in touch with them. Finally his father became interested and together they put in a ¾ k.w. Winger transformer and a flock of Murdock moulded condensers and stepped out for a while, until the Murdocks started popping. So efficient did they become at popping condensers that they claim the championship. After the Murdocks had almost bankrupted them they tore them apart and built an oil condenser using the copper plates, which finally turned the trick.

(*Concluded on page 53*)

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Engineering Library



The Second District Convention.

THE convention and exhibit held under the auspices of the Executive Radio Council of the Second District at the Hotel Pennsylvania in New York City, March 16, 17, 18 and 19th, was the biggest affair ever held in amateur radio and a very definite contribution to the advancement of Citizen Radio.

On the hotel roof a wonderful exhibit of amateur apparatus was displayed for four days, with most of the prominent manufacturers of America exhibiting their product. Technical talks by prominent radio men were held every afternoon and evening in the adjoining Butterfly Room, and on the last night a most successful banquet was held in the grand ballroom of the hotel with an attendance that eclipsed all amateur records. Special events and stunts added to the interest thruout the four days, and everyone is agreed that a new high-water mark in amateur affairs was set by the meet.

This was the first amateur undertaking in the east in which a serious effort was made to attract the interest of the general public and so increase the prestige of Citizen Wireless. This exhibit was managed in a splendid and professional-like manner from start to finish, publicity was secured in the New York newspapers, and the public responded. The total attendance during the four days was 5165 of which 2765 were paid admissions and the remainder "repeaters" on "season tickets". It is impossible in our limited space to go into any detailed description of the exhibits, but certainly they were a thing to bring joy to the heart of every radio man. Our foremost manufacturers spared neither time nor money to bring the best and newest of their products to the show for all to inspect, and the roof was a maze of aerials which led to the various booths where loud-speakers on receivers vied with the sparks of transmitters in noise making. Among the exhibitors of apparatus were Acme, Adams-Morgan, American Electro Technical, Amrad, Burgess, C.R.L., Clapp-Eastham, Continental, deForest, Doolittle, Federal, Grebe, Mesco, Murdock, Pacent, Lehigh, Radio Corporation, Radisco, Ship Owners', Shotton, Super-Radio, Tuska, Westchester, Westinghouse, and the Army, Navy, and Department of Commerce, and it took the good radio men the full four days to soak in all the dope that could be gathered by circulating thru the hall and studying the displays, asking questions, collecting literature, and getting acquainted.

The series of impromptu talks and lectures on various radio subjects was an interesting feature of the convention. Mr. H. C. Gawler described the new C.W. tubes of the Radio Corporation; Mr. L. M. Clement displayed the Western Electric-Bray movie of the inside action of a vacuum tube in illustration of an excellent lecture on that subject; Mr. R. A. Heising, also of the Western Electric, talked on the constant current system of modulation commonly associated with his name; Mr. G. J. Eltz, of the Mesco stores, discussed antenna and ground resistances; Mr. Edwin H. Armstrong gave a helpful talk on short wave reception at radio frequencies, followed by "Paragon Paul" F. Godley on short wave regeneration. Mr. R. F. Gowen, chief engineer of the deForest Company, described the new equipment of that company; Mr. Frank Conrad displayed the new receiving equipment of the Westinghouse Company and described it and

President Sends Greetings to Second District Meet

President Harding sent the following radiogram to the New York Convention. It was sent out by NAA after time signals on the opening day and was copied direct at the Convention hall. The President said:

"Citizens Radio Operators Convention,
Pennsylvania Hotel,
New York City.

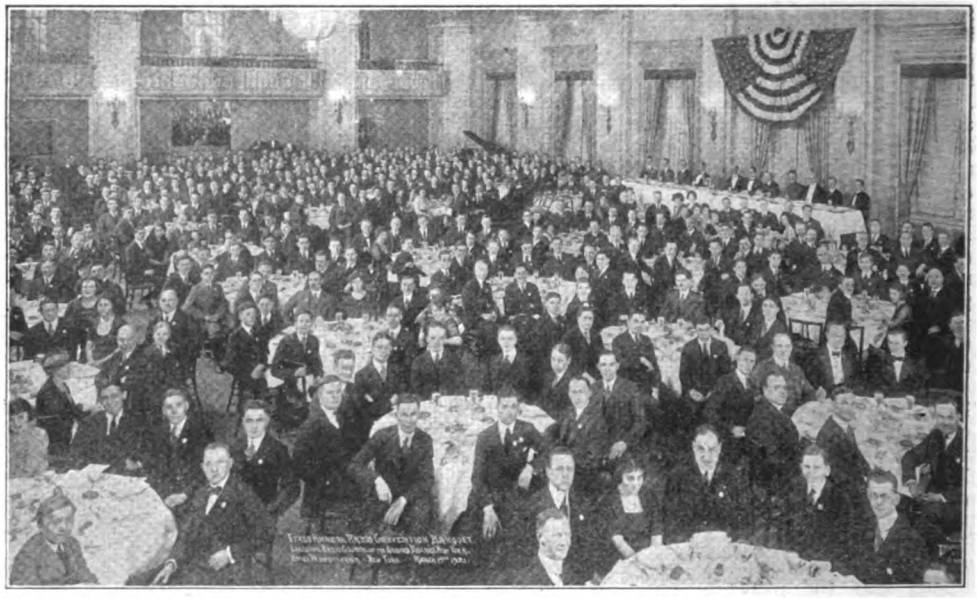
Greetings and good wishes to an organization whose members have always been leaders of interest in development of the radio science and whose service during the war and since have been of real public benefit.

WARREN G. HARDING."

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its development; and Mr. K. B. Warner, Editor of QST, spoke on C.W. Transmission. These talks were scattered over the afternoons of each day. On Friday evening a general convention meeting was held under the chairmanship of Mr. E. A. Beane, Chairman of the Council. Matters of co-operation were discussed at length and the meeting was addressed by Radio Inspector Arthur Batcheller and by Mr. Chas. H. Stewart, Manager of the Atlantic Division of the A.R.R.L.

"Wireless Age" and "Radio News" had booths, and so did the A.R.R.L. At our booth Traffic Manager Schnell kept open house, assisted by Miss Peggy King of our staff, and entertained hundreds of visitors during the four days.



On the evenings of the first three days a contest was held for the world's championship in reception. This was a free-for-all and a large number of entrants started, rapidly dwindling away as the elimination tests proceeded into speeds above 35 words per minute. As the speed grew faster the field narrowed down and the excitement increased apace, with crowds trying to get in to view the few remaining contestants who were then arousing admiration by copying speeds over 40 per. The end was a duel between B. G. Seutter, of the "New York Times" radio station, and N. Bernstein, of Brooklyn, prominent member of the R.T.A. and a Western Union operator by profession, and both had no difficulty in making perfect copy at speeds above 45. Finally Seutter got a wee bit the better of it and hung up a new world's record in copying 48.6 words per minute for two minutes, total 97.2 words, with 2 errors; net result 48.6 words per error, as against the former world's record established by Tony Gerhardt at the Pacific Convention at Frisco last Thanksgiving, who copied 49.25 words per minute for 4 minutes, 197 words total, with 5 errors, netting 39.4 words per error. On this basis Seutter was presented during the banquet with a handsome silver cup, suitably engraved, and is hailed as the new title-holder. (The Providence Tribune had a New York dispatch quoting the new record as 84% w.p.m., which excited the wonder of all the Providence amateurs. For ourselves, we admit that 48% is going some.)

Mr. Bernstein, who came out second in the speed classic, took first prize of a Grebe detector-two step donated by its makers as the winner of a field of twenty-five in the jamming contest, while Albert Bischoff, 2AMF, of Newark, took the main prize in the contest for the best home-made apparatus. The Continental Radio & Elec. Corpn. offered a Paragon RA-10 for the club having the largest attendance at the dinner, and this prize went to the Radio Traffic Association of Brooklyn.

As an interesting side-light, 2ZL, J. O. Smith, Valley Stream, transmitted a thousand-word press story on the convention to 1AE, S. B. Young, Dorchester, for publication in New England Div. Mgr. Guy R. Entwistle's radio column in "The Boston Traveler". Both are C.W. stations. The transmission was accomplished in 1 hr. 20 min., and is rather a record.

The banquet on the last night was a

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brilliant affair, ably presided over by Mr. J. O. Smith, who by the way was Chairman of the Council's Convention Committee. Five hundred and ninety-six enthusiastic radio folks gathered in the beautiful ball room of the Pennsylvania and heartily enjoyed a splendid dinner and a series of brief addresses by prominent radio lights, interspersed with a little entertainment. This attendance eclipses all former records for an amateur banquet. The speakers were, besides Mr. Smith, Mr. H. C. Gawler; Mr. F. H. Schnell, our Traffic Manager; Dr. A. N. Goldsmith, Secretary of the I.R.E.; Mr. J. Andrew White, Editor, Wireless Age; Mr. H. P. Maxim, our president; Mr. Arthur Batcheller, local radio inspector; Lieut.-Com. D. C. Patterson, Naval District Communication Superintendent; Mr. Edwin H. Armstrong, who needs no introduction; Lieut. H. S. Paddock of the U. S. Signal Corps; Mr. P. F. Godley of Paragon fame; and Mr. K. B. Warner, Editor, QST. At the conclusion of the evening an immense "hatchet" was brought in and with great ceremony was formally buried in token of the birth of a new feeling of solidarity and union of purpose among Second District amateurs.

Our heartiest congratulations to the Second District amateurs. A most splendid job they did, and their achievement will ever stand as having marked a distinct step forward in the affairs of amateur radio—a job done up in typical New York style and of a nature that only New York could do.

Ohio Radio Convention

One hundred and sixty enthusiastic radio men met in an Ohio Convention in Columbus on March 5th under the auspices of The Columbus Radio Club and A. R.R.L. At 10:30 a.m. there was a get-together meeting in the Southern Hotel with Mr. Lucas president of the local club, presiding. After lunch a technical meeting convened, and some very interesting papers were delivered.

Traffic Manager Schnell spoke on the efficient handling of relay traffic and gave pointers for the guidance of new-comers. He was followed by Mrs. Chas. Candler, 8ZL, who very interestingly told how she handled traffic. Mrs. Candler stated that on "sitting in" she always listened for thirty minutes before opening up, in order to ascertain what stations could be worked consistently that night, thus avoiding QRM from unsuccessful attempts to connect thru fading, etc., and she also pointed out the importance of knowledge of geography as a preventive of poor routing. R. H. G. Mathews of 9ZN spoke on spark transmitters in his customary fashion, and characterized the hot-wire ammeter as the second biggest liar, stating that the first B.L. was the reported circulation of two w.k. magazines. Mr. Candler told of the apparatus at 8ZL, incidentally mentioning that the same condenser has been in use there for six years. (Knock wood, O.M.) R. A. Brown, 8XI, Ohio State U., delivered a valuable talk on the interior action of vacuum tubes, illustrated with many curves. R. S. Copp, of McCook Aviation Field station WA1, spoke on C.W., both AC and DC, explaining the action of various circuits in detail. Ohio is "nuts" on C.W., and paper and pencils were very much in evidence while Mr. Copp spoke.

A splendid banquet was held in the evening, Mr. R. C. Higgy introducing Mr. J. Breeze as Toastmaster, which position the latter gentleman certainly occupied to the satisfaction of all present, many "Hi's" attesting to his wit. The evening speakers were Mrs. Candler, Messrs. Lucas, Mathews, Schnell, Spiller of Cleveland, Breckel of 8XB, Combs, and Copp.

The Second Annual Banquet of The Radio Club of Tacoma.

As reported by Royal Mumford, 7ZJ.

You know I've always thot there weren't many Tacoma fellows in the wireless game. But it's a mistake. Bill and Russ and I counted at least a hundred on a little walk of just a few blocks on our first morning there. You see we arrived on the morning train at 5:25 and first thing we did after getting a bite to eat was to go around and wake up 7CE. I 'spose he had been up late the nite before, but he didn't seem to hold any grouch on that 6:30 visit. Mighty fine fellow Reichert is, and a mighty good station he has. Besides being president of the Tacoma Radio Club, he is an all-around good fellow and a far sighted radio enthusiast.

The members of the Tacoma Radio Club have been working on this banquet for a long time. You would be surprised to know how hard all the mothers, sisters, and sweethearts did work to make it the success it was. It adds all kind of pep to a radio club to have enough of the fair sex in attendance so that everything isn't a stag affair. And you have to hand it to the Tacoma Club, they have some real lady operators.

Walking into the banquet rooms we first noticed a miniature antenna erected in the center of one of the tables. It was made of real wire, and the cute little lead-in went straight thru the roof of one of Miss 7CB's doll houses! And the operator —he was a Kewpie friend of another fair operator and was 'sposed to represent the Young Squirt. And say—the miniature pair of fones he wore! No ordinary radio operator put on that artistic finish—it showed unmistakable feminine handiwork.

In one corner was a huge Magnavox

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and we were promised some radio music. There was no hesitation in the promise. And later we found their confidence was not misplaced, for they had an emergency phonograph in the kitchen that worked the Magnavox to capacity. The whole room was exquisitely decorated and believe me we cannot help but admire all this work. I'll bet the women folks put up the biggest part of it. And of course we know they put up the eats, and washed the dishes—but that comes later.

President Reichert met us in the hall and the reception he gave us one and all we never will forget! Everybody had a tag tied on his lapel with his call letters and name. We met and shook with familiar sparks. There is 7BK of Seattle. The quiet student we meet is entirely different from the anticipated possessor of the cleanest and snappiest fist in Seattle. There is CL1 in uniform. We almost expected to see him in rags and tags after those rumored riots over hold-up accusations at Camp Lewis. But no, he is the smartest dressing dressing soldier I ever saw. Then we meet 7BQ of Eugene, and any number of more or less familiar sparks of Seattle and Tacoma. With us three from Portland and Vancouver they had quite a gathering of radio men of the Pacific Northwest.

The foremost topic of conversation was that most annoying feature of our communications between Portland and Tacoma, QSS. From what I learned they hear us about the same as we hear them. Of course they think we're pretty poor actors I guess. But I sure have changed my mind about them. The livest bunch of radio fellows anywhere are right in Tacoma. And I haven't told you about the species OW, YL, OG, or WW, of whom at least a dozen were present. But they were QRW with eats in the kitchen. And when we sat down to the spread of honest-to-goodness home-made food, and were waited upon by the young ladies of the Tacoma Radio Club—say, you stay-at-homes were sure SOL.

Then we were introduced to the members of the Tacoma Radio Club by our toastmaster. To these gentlemen we are indebted to no small part of our entertainment. Then each of us in turn had a chance to say more or less. It was worth the whole fare here and back to hear what these fellows representing the entire Pacific Northwest had to say. Sometimes we held our sides in laughter at the recital of some humorous anocdote. Then our hearts expanded in appreciation of our reception with every expression of thanks for this wonderful banquet. I must mention in particular President Reichert's speech. We understood with his opening words the success of the Tacoma Radio Club. Their organization is founded on the subordination of individual interests for the benefit of the whole. I thot of the minor petty jealousies and predjudices that wreck many an otherwise promising Radio Club. Here they nipped that in the bud. "Co-operation" was the keynote of his speech. We thrilled with pride as he mentioned the possibilities of the co-operation of all the radio clubs of the Northwest, and an annual meeting. Nearly everybody present expressed approval of his idea. No one club would necessarily lose its prestige in the least, while every one of us would be decidedly benefitted by the wonderful results of our co-operation.

And in the midst of our eats, what gentleman is that at this late hour? We were all introduced to Rev. Sebastian Ruth, better known as 7YS. He is first and foremost a radio enthusiast. We welcome his hearty enthusiasm.

Did we all admire the good looking smile of Miss Winifred Dow, 7CB, the first fair operator in the division? I'll say we did. And is that her twin sister who coaxed us all into making away with another piece of cake? Her sister, yes, but not her twin altho we can hardly tell them apart. Both are spilling over with enthusiasm just like an oscillating audion. And then there were others. But we hear, "Surely they can't be radio ops, there ain't any place for the phones!" NO! But, you just otta see a girl copy. Gee but it's great when they write down every letter at 20 per. You've got to give 'em credit for more gray matter than the average.

Next day we travelled all over Tacoma. Saw the city, saw stations and stations without end. First class sets too. I never did see so much high grade receiving apparatus or so many panel transmitters. I tell you these Tacoma birds are right up to date. A fellow here without a loop or cage is actually considered slow in this burg.

And the hospitality of Mr. and Mrs. 7CB and family. They outdid themselves in their efforts to entertain. They dubbed Russ "Slim" for short, but always were forgetting themselves and calling him "Fat". They called Bill "Dimples" because he didn't have any. Say, fellows, you certainly missed the jolliest time you ever had in your life if you didn't get in on this banquet. I actually had no idea that such an honest-to-goodness good time was possible. One and all, we will never forget the solid enjoyment of the Tacoma Club's entertainment. Why, we're already looking forward to their banquet next year. The only way it could be better would be for a few more outsiders to come and allow themselves to be entertained. And that is just what these Tacoma sports are planning on.

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EVER suddenly become aware some good radio night that in the last ten minutes all signals have curiously become weaker, and looked over your shoulder to discover that the sun was coming up? If you have you are eligible for admission to the Boiled Owls—fellows who have sat out a "night" until there was nothing left to it.

Many new members were made during the January Transcons we'll wager. We know that 8ZY, 9ZN, 1MO, 1AW, 2TT, 1TS, 8ZL, and 1KBW belong. Who else claims membership in this fraternity of the bloodshot eye and the taste like a blacksmith's apron?

The Old Man started something when he dubbed us Boiled Owls.

Newspaper headline: "Scientists discover that sleep is not necessary for bodily health". Something new? Hell no! Boy, page Mr. Hewitt of 2RK and Mr. Mix of 1TS!

In an editorial on page 29 of March QST, mention was made of the work 1AE was doing on C.W., in company with several other stations, all using a wave length of about 350 meters. We should have mentioned that 1AE is operating on 340 meters under a temporary permit from the Radio Inspector—not simply banging away over 200 on his own hook.

One of the gang suggests that when the Blue Laws come into effect they will seal our receiving sets on KDKA's wave so we can hear nothing but church services.

8ATU defines the neight of his ambition as
A reputation like 8ZL's
A wave like NAM's (Hi!)
A tone like 8IU's
Power like NSS
A sense of hunmor like T.O.M.'s.

The Army Air Service stations XK-1, Mitchell Field, L. I.; XB-1 Bolling Field, Anacostia; and XF-1, Langley Field, Hampton, Va., are equipped with 1 k.w. deForest Oscillion transmitters operating on 375 and 450 m. XK-1, operated by H. J. Perkins (8AEC), requests reports on its sigs, working CW on 375 m. with 4 amps. from 7 to 8 p.m., and CW and phone on 450 m. with over 5 amps. thereafter. They will be glad to QSR relay traffic as far south as XF-1.

A formidable document has been received here wherein eight good amateurs attest that at 6WN, in San Diego, Cal., the signals of 6MZ, in Del Mar, can be read by sense of touch, placing the fingers across the phone terminals. A five-step amplifier was used.

6MZ has entered formal claim for the hand engraved rubber spark gap. Has any eastern bird done better?

Thru error the advertising of American Electro Technical Appliance Co. has mentioned their catalog of 84 pages. It should have read 24 pages.

We are mighty proud of our cover this month. This work is the product of The Grogan Photo System, Inc., in Milwaukee, whose business is illustrating merchandise and stimulating sales by photographic advertising, and is a much appreciated gift to us from Mr. Merwin Grogan, Publicity Manager of The Milwaukee Amateurs' Radio Club (affiliated). The Y.L., by the way, is a well known model in that part of the country.

We again wish to point out to our readers that in writing authors concerning articles in QST it is the smallest common courtesy to enclose a stamped self-addressed envelope for their convenience in replying.

Guy R. Entwistle, New England Division Manager, is conducting an interesting column every week in the "Boston Traveler", an evening paper, under the title "Citizen Wireless—Dots and Dashes". The radio news of the amateur world is reviewed, and information valuable both to amateurs and newcomers in the study of Citizen Wireless is incorporated. We would like to see more of these columns—they do a good work in stimulating interest in Radio.

Re our mention of the arrival of the power tubes. It should be noted that the Audiotron Mfg. Co. is handling these same tubes under the name of Cunningham

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tubes. Both they and the Radiotrons are made by the General Electric interests.

Well, well, well. Have you seen "The Radio Condenser", published in Baltimore? If any Third District amateur is missing it, let him get wise, for here's another of those chummy little magazines full of the local news and the spirit that puts pep into things. (Besides, Miss Garmhausen is on its Staff.) Next to "Radio Topics" the "Condenser" is the most ambitious of the sectional organs that has come to our notice in size, scope and appearance. We offer our admiration and congratulations. It would seem to us that the "Condenser" might well become the mouthpiece of the recently-formed Third District Council, since from its inception it has devoted itself wholeheartedly to Third District affairs and has shown that it stands for the best in amateur operation.

The Delta Division has caught the spirit, too, and blossomed forth with a three-page mimeograph monthly named the "Delta Division News". This is another of the strictly A.R.R.L. publications, gotten up by A.R.R.L. men for A.R.R.L. men. They serve a most useful purpose in a division, giving the Division Manager a means of addressing his own personnel at length on A.R.R.L. matters, and serving to hold the crew fast together with the old inimitable A.R.R.L. spirit.

1OE has an enclosed gap in which the housing is made from the brake-drum of a Chalmers car with a Ford rear wheel hub and flange bolted to it to cut down the size of the hole in the center, the tapered axle hole run full of good babbit and bored to fit the rotor shaft, thus providing a 4½" bearing on which a Benwood rotor is mounted. The cover is a piece of ¼" boiler plate, and the stationery electrodes are mounted in fibre bushings in 1½" holes in opposite sides of the case. This gap cannot be heard outside the station room.

"One or two more conventions in quick succession and we know where we could find several healthy cases of divorce, desertion, separation, etc."—R. T. A. Bulletin (New York).

But of course Thiede has been married only a couplamonths.

Ever find a message coming in for you and discover yourself completely minus paper and pencil? A member suggests that a slate and pencil, tied to the table, will prevent such a predicament.

Canadian 3GE has overcome induction in his receiving set from nearby power lines by simply connecting the filament end of his secondary (loose-coupler or honeycomb) to the ground end of the primary. Well worth trying.



IN 1928 FATHER INSTALLS A RADIOTELESCOPOGRAPH

The Parkin Mfg. Co., of San Rafael, Calif., agree that it is time for the prices of radio apparatus to take a drop, and in their new catalog they have reduced the prices to the tune of about 25% on most of their products. We're glad to see the downward tendency.

Re the list of big DX records published in April QST: the following additional records have since come to our attention:—

2ZM, Paterson, N. J., heard on C.W. by ship off Guatemala on Pacific side, as mentioned in "The Log of an Amateur at Sea" in our March issue. 2ZM's input at the time was 850 watts, wave 325 m.

8ML, Cleveland, heard Feb. 26 at 7ZJ, Vancouver, Wash.

8IK, Ashland, Ohio, heard Feb. 23d by 7JE while operating on U.S.S. Snohomish at Port Angeles, Wash. 8IK was using a 15-watt C.W. set—get that, you spark hounds: fifteen watts.

9ZB, the Benwood station, St. Louis, has been reported from Los Angeles.

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2RK and 3DH (now 3XM) also join the ever-increasing bunch of transcontinentals, both now having been reported by a ship operator off the California coast; details lacking.

WOULDN'T IT BE WONDERFUL—

If 2EL would break a leg or else borrow a Kolster so we 4th district felows can hear somebody else besides him? (Signed by six 4th-district amateurs.)

If 8BBD and 8ANE would junk those side-swipers?

If 4YA cut out that derned "Hi! Hi!" every other word while working local Atlanta mugs on high power?

If 6EA and 6GI could work 5ZJ?

If 8AAZ would forget to call the roll some night?

If 1JBT wouldn't use a full kilowatt to work a certain 18-watt spark coil around the corner from his station?

If 5DA was on the job every night?

If 5ZA could get 4YA like the latter gets him?

If the telephone companies just loved us?

If 3GO would tell us where his VT-1's come from?

If 3HJ would take a vacation?

If the ops at NAI, WHE and 3XM wud get their toes manicured before they go on watch so that they wouldn't get 'em mixed up in the set screws on the key?

If 2RK's new 500 cycle set made one quarter the noise that his old synchronous fog-horn made?

If U.S. amateurs would stop reporting American 3BP when it has already been announced that he isn't working and that the 3BP they hear is Canadian 3BP. (Listen for that intermediate "FM".—Ed.)

If 1GM would stop CQ-ing after ten p.m.?

If NAD would get up off 200 meters?

If 4GF could get outside of Savannah on his half k.w.?

Dear Eddy:

Please advise if 73 means you have 73 msgs to send, and if so how do these fellows have so many all the time?

D. B.

You answer him, Vermilya—here's our largest ohm saw.

Cleaning Copper Quenched Gap Plates

Instead of using a piece of emery cloth and tediously polishing the surface of each individual plate of your quenched gap, buy a few thimblesful of concentrated nitric acid. Soak the end of a piece of wood covered with waste in this acid and "wash" the sparking surface with it, dipping it immediately in water to get rid of the acid. It gives a beautiful surface without effort and in far less time. Be careful of the brown nitrogen dioxide fumes which come off. Altho they are not poisonous they could not exactly be recommended as a good substitute for air.

—Contributed by A. W. Parkes.

In Portland, Oregon you do not buy your apparatus on the installment plan. Instead you get your short wave regenerative set on the "piece at a time" plan. It is like this, and the plan seems quite original to us: The purchaser who does not accumulate cash at a rapid rate saves until he has enough for the purchase of the stock variometers which are used in the final construction of this set. He takes them home, and puts them to use with the apparatus that he may already possess. He also begins again to save money until he can purchase a stock vario-coupler of the same make. This he also puts to use along with the variometers. Later he may purchase the series condenser that goes in the set. And finally, when he has the balance of the price of a new set in hand he may pack up his variometers, vario-coupler, and series condenser, and send the bunch in to the manufacturer. In a few days back comes his same pieces of apparatus all nicely mounted in a standard oak cabinet, and on a bakelite panel with all controls, binding posts, etc. And all told he has only paid the price he would have had to pay for a complete set, and has had the advantage of having the use of the parts of the set as fast as he has earned the money to buy them with. And he has a real set in the end.

Northwestern Division News.

P. A. B. says that altho his sister's youngest kid ate all the currents from his A battery, and the bees from his B battery ate the honey from his honeycomb coils, he was able to hear Mars tell Venus last night to go chase herself.

Never listen in before calling CQ. 3PU doesn't, so why should you?

Don I. Bailey

(*Concluded from page 46*)

About a year later they junked the old transmitting set and put in modern apparatus.

Don took four examinations for the Navy, three for the Army and two for the Draft but was S.O.L. Probably if he had claimed exemption he could have gotten across, but as it was he was placed in Class 1A and there remained, ending by instructing code in the Vocational School of the State University of Iowa. Since the war 9CS has joined the Amrad users, and the receiving set has been completely changed, it now being a C.R.L. Paragon and a Tresco Universal 150 m. to 20,000 m. cabinet, with a radiophone and a ½ k.w. arc set under construction.

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Radio Communications by the Amateurs



The Publishers of QST assume no responsibility for statements made herein by correspondents.

"HEARD AT SEA."

(Note: Mr. Guthrie's letter has brought forth a storm of protest, from which we publish a few letters.

The A.R.R.L. has always discountenanced work between amateurs and ships at sea in the knowledge that it is absolutely contrary to the law. A.R.R.L. relay men have been active in reporting and stopping such activity in many instances. Nor would we ask any operator to do a single thing that detracted from the rigid observance of his duties. We certainly agree with our readers, however, that an operator's time off-duty is his own, and believe that Mr. Guthrie will agree with us that it is better to have the operator in the static room listening on 200 than to have him get out as quickly as his watch is over.)

QST, then, will continue the publication of calls heard at sea when it seems probable that the operators turning in the lists have not neglected their duties to give us a helping hand.—Editor.

Madison, N. J.,

Editor, QST:—

In regard to the letter of Mr. L. R. Rutter and Mr. F. P. Guthrie in the March issue of QST on page 52, I would like to state some plain facts as seen by the commercial operator himself. I, being a commercial operator, am able to lay bare these facts.

I shall first touch on their 3rd paragraph which is the most important.

We shall let out the 2-man ship as this type of ship usually is large and a continuous watch is required. The one-man ship is the key to this whole situation.

In the old type of watch the operator was required to listen in the first 15 minutes of every hour, from 8:00 a.m. to 8:00 p.m. and many operators still use this type of watch. The new type of Shipping Board watch, known as the zone system, which came out about last September, required Shipping Board operators to listen in 2 hours straight and then he is off 2 hours, then on again for 2 hours, etc. The time of this watch is governed by the longitude in which the ship is.

It will be seen that in the first type of watch the operator has the last three quarters of an hour to himself, he being off watch. In the second type of watch the operator is off watch 2 hours at a time.

Does anyone mean to say a commercial operator has no time to listen in on 200 meters?

As for an SOS, the operator would not hear it anyway if the SOS occurred between watches and the operator was off watch.

As a ship has the privilege of broadening its wave when sending an SOS, if the operator was listening in on 200 meters at the time, it seems highly probable to me that it could be heard. Many ships can be heard on 200 meters when they are working on 600 meters *and they are not supposed to be heard on 200 meters.* I'll admit that there are quite a few well tuned ship stations, but they are few and far between.

I thoroly agree with the fourth paragraph of said letter. Amateur stations should not work commercial stations. It is not only against the rules but it causes unnecessary QRM.

The fifth and last paragraph of Mr. Rutter and Mr. Guthrie's letter is absolutely out of the question. Their suggestion may be all right for the ham squeak-box stations of yesterday but not for our modern amateur 1 K.W's., C.W. and radiofone stations of today. This is proven by our recent attempts to bridge the great pond. We are continuously reaching out and as our ranges gradually increase, the old U.S. will have become too small to test the ranges of our stations.

Take for instance, if we had a thoroly modern amateur station in California which was heard very QSA on the Atlantic Coast, his range would naturally be greater than the breadth of the U.S. (especially when using C.W.) and the only practical way to find his correct or maximum range would be for a Europe-bound ship to listen in for him until his signals grew weak and unreliable. Adding the total number of miles from coast to coast to that of the number of miles the ship is off shore would give the maximum range of said station.

Further comment is invited.

Sincerely,

A. G. Dick, "XN".

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26 Kent St., Gloversville, N. Y.

Editor, QST:

I notice on page 52 of March QST the letter by Mr. Guthrie in regard to the amateur calls heard at sea by commercial operators on U.S.S.B. vessels.

On page 9 of December issue of the Radio Service Bulletin, year of 1920, there is an article in regard to the hours that operators on U.S.S.B. ships stand watch, on ships that carry only one operator. Of the schedules for the five different zones, eight hours is the maximum number of hours that the operator has to stand watch in any twenty-four. This leaves the operator sixteen hours off duty. It does not seem that it would harm the receiving set any aboard the ship to listen to the 200 meter amateur stations for an hour or two daily; besides, the operator gets some very good practice.

As long as the operators put in their required eight hours of specified time each day on commercial traffic there is none of the U.S.S.B. time wasted, even if the operators listen to 200 meter amateurs off duty. It is possible that the operator might miss an SOS call if he at that moment were listening to 200 meter stations, but I don't believe that many operators are going to listen on 600 meters off watch in hopes that a stray SOS might come that way. It seems to me that such a schedule would make a more of a miss in receiving SOS calls because it leaves all the one-man ship operators off duty at one time, leaving all the responsibility of receiving SOS calls on the vessels that carry two or more operators and keep a continuous watch. Such ships are quite often a goodly distance from each other.

Regardless of how much the operator listens in on the two hundred meter wave when he is off duty the operator's log shows how much time he put in and also what kind of duty. It would be impossible for the operator to fake the call letters of ships he heard and get away with it as in checking up the calls he surely could be caught. No one can listen in on 200 and 600 meter wave lengths at the same time and keep any kind of a log.

It is a mighty hard life on many of the U.S.S.B. ships, taking all into consideration, and I am sure no human being would want to deprive any one of a little recreation off duty. I have been a commercial operator for some time and as yet have a commercial first grade license. I was in the amateur game from 1913 until a few years ago when I took up the commercial part of it, but I am back to the amateur end of it for good now, for going to sea on U.S.S.B. ships is no life; it's life lost.

All for rightfullness,
Louis E. Krieg, Jr.

609 W. 30 Street,
Indianapolis, Ind.

Editor, QST:

In regard to the article in the March QST pertaining to the publishing of calls heard at sea, I am positive that the writer overlooked quite a few things. I just returned home after eight months of commercial work in the gulf and have sent in a list of calls heard on two different occasions. I agree that it is contrary to rules and regulations to work with amateurs from ship stations. Both lists that were turned in, first from the S.S. Coppename and then the S.S. Ellis, were calls that were heard while IN PORT. As there are no watches kept while in port this was done for pastime and is absolutely within the law.

It is true that most of the ships reporting calls give their position somewhere at sea but in all cases I have noticed that they were one operator ships which DO NOT REQUIRE CONTINUOUS WATCH. I was never on a one-operator ship myself but I have a great many friends who were and none of them were supposed to remain on watch after Arlington had finished broadcasting his WX, PX, and TRFC, providing all traffic was cleared and there was nothing special to stand by for. After this time why shouldn't an operator tune down to two hundred meters if he is interested in the amateur work? If he didn't do this he would probably turn in or engage in some other pastime, so I think that it is a very good idea to publish the calls heard at sea as it gives the amateurs a better idea of how they are getting out as well as putting a little spirit into the monotony of commercial operating.

Very truly yours,
M. B. Lowe.

OUR RAISON D'ETRE.

6227 Kimbark Ave.,
Chicago, Ill.

Editor, QST:

In your article in the February QST on Transatlantic Sending Tests, you make the statement that the English radio experimenter is more of an "engineer" than an "amateur". It seems to me that this distinction between the engineer and the amateur should be given more attention than it is at present, especially in the case of the American amateur. Of course it is possible for a radio man to be both an amateur and an engineer, but I believe you will find most of us to be predominantly of the one type or the other. It is a state of mind: the engineer making his own apparatus for the joy of being able to create it, and using it for the sake of the results he gets out of it; and the amateur either buying his apparatus completely assembled, and as nearly as possible ready to

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use, or operating the set of one of his neighbors, who is an engineer.

Amateur radio has a threefold argument for existing: first, that it is a right for citizens to be able to communicate freely with each other; second, that the amateurs provide trained operators essential for military uses in defense of the country in case of war; and third, that real improvements in the art and science of radio must result from the unrestricted experimenting of the amateurs. Granting the first point, I believe it will be seen that, excepting accidental discoveries, the "amateur" type provides the second, and the "engineer" type the third argument. And altho I may be in error, it is my personal conviction that the third reason for the permission of amateur radio is by far the most important. No one can foretell for what necessity Americans will have to defend their country, and moreover operators can, if necessary, be trained (in code, at least) inside of a month; but the advances of radio are real and permanent contributions to America and to mankind.

It follows that the really important use of the A.R.R.L. relay messages is to provide material for the engineer to use in weeding out the defects and unnecessary parts of the equipment they are using, and to establish the value of the improvements they adopt. And this sort of testing is worth more than all the "amateur" gossiping in the world. Coast to coast relays such as the recent record-breaking ones would have been impossible with the crystal detectors and untuned and inefficient transmitting sets we used before the war. The introduction of vacuum tubes and regenerative circuits is due to the work of American amateur radio *engineers*.

I am afraid that my use of the words "amateur" and "engineer" has been unfortunate, since the word "amateur", as usually used, includes both classes of radio men. Perhaps "ham" would have been better. But a real distinction exists, and I hope QST will encourage the growth of an increasing number of amateur radio engineers.

Sincerely yours,
Kenneth H. Goode, 9BJ.

TO GET EVEN FOR WHICH WE'LL JUST PUBLISH AN EXTRA PAGE OF 'EM!

1022 So. Ash Street,
Casper, Wyoming.

Dear Eddy:

I am so blamed hot under the collar that if I had on a celluloid neck piece it would be smoking now. Take the darn —— —— and turn to page 654 in "Correspondence from our Readers" and see what Honorable Mr. S....sky (a Bolshevik I bet two bits by his name) says about calls heard. Man, he is hitting at our beloved QST and, by golly, Eddy, are you going to let him get away with it? He hasn't the guts to mention QST and anything a relay man hates is a bird who beats around the bust. I'll bet my whole set he hasn't a transmitter and can't receive over two words a minute and then comes out with the stuff he has about "Don't publish Calls Heard". It has made me so blamed sore that I can't punch this old mill as you will see by the erasures on this page. Eddy if we only could put in print what is on our mind it would have to be in a world where there are no fair sex radio hams, but as it is I guess we will have to holler to one that is with us and let it stop at that. But just wanted you to know that such rot gets our nanny and if you start a rumpus with such birds and get into trouble we are all on your tail with a check book to see you thru. Nuff for now, OM.

Very truly yours,
Norman R. Hood, 7KX.

11 Lake Terrace,
Newton Center, Mass.

Editor, QST:

In view of the remarkable publication of yours, and its fine work in the development of amateur radio exclusively, allow me to respectfully submit the following:

I recently noticed an article in a well-known radio publication which seemed, for ome unknown cause, to be extremely prejudicial against the section known as "Calls Heard" which, the writer said, is "but useless 'truck' that some publications use to fill up space, which might be used for valuable articles."

With all due respect may I inquire what this person considers to be valuable? True, the discussions and articles on the various instruments and their theory and operation are valuable, very valuable, but also they are numerous.

A magazine that deals with amateur radio must be expected to put its best foot forward to aid the advancement of what it stands for. May I ask of any real live "ham" that owns anything from a Ford coil to a Poulsen arc, what section of QST he first hastily turns to, with an eager and hopeful heart that perhaps his little home-made rotary has set somebody's far-distant diaphragms to wiggling; or the old boy who has a vague idea that his friend the commercial "op", who promised to listen for him in Argentina, would publish a list of 200 meter calls?

A great man once wrote, "United we stand, divided we fall!" This might be modified to say, "The firmer the bonds that bind us, the steadier may we stand." Certainly that applies to amateur radio. We really may hardly consider ourselves on a very solid foundation, and unless we

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work together, and keep in touch with each other as much as possible, with a lot of friendly competition to keep the goal always ahead; and lastly, to keep all that savors of commercialism out of the game, we are apt to find ourselves each at the edge of an individual pit of darkness, which is the worth that could befall.

Yours very sincerely,
R. D. Ayer.

A GOOD IDEA.

197 Dearing St.,
Athens, Georgia.

Editor, QST:

What do you think of the idea of amateurs registering their calls with the Postmasters of their respective towns or cities? I believe every amateur prizes his radio correspondence almost as highly as he does his set, and lack of names and addresses prevents delivery of many cards and letters. Many time I have worked a station, perhaps under difficulties, and, asking for QRA got "QRA Pittsburgh, Pa." Now how in the name of Sam Hill can I WRITE A FELLOW on such dope as that!

By the simple expedient of registering their calls with their Postmasters every operator would be assured of receiving all mail addressed simply to HIS STATION, with city and state address of course. For instance:—*Radio Station 4AG, Athens, Ga.* on a postcard or envelope would be immediately delivered to OM W. B. Pope, 197 Dearing St., Athens, GA.

If this idea appeals to you get busy and give it publicity in "QST" and let's stop the return of so many card and letters "For better address".

With best wishes, I am,
Yours very truly,
W. B. Pope, 4AG.

CO-OPERATION.

Hammond, Ind.
Feb. 17th, 1921.

Editor, QST:

This can be classed as "another country hear from" for it is my first attempt to gain recognition as a contemporary of O. Henry or any of the rest of the humorists and satirists. However, being constituted about the same as the general run of "radio bugs", there are a few thots in my mind which are just naturally HOWLING for utterance.

I'll open my little story with an incident which we have all experienced more or less—and to those to whom the "less" applies let me say they can consider themselves favored by the gods. How many of us have seated ourselves at our operating table on a good cold, crisp night, thinking to hear a little DX, and then find the "young squirt" who lives about five blocks away evidently trying to see how long his arm will hold out and making a pretty fair endurance record at that? Do I hear remarks from several?—you bet I do!! Well, I don't know about the rest of you but on the first occasion that I had this delightful experience I bethot myself of the telephone as a medium of arbitration. Consequently, I hied myself hence, but soon learned what a simpleton I was to dream of arranging matters in that manner. There was no chance to reason with "friend squirt" and arbitration was not in his vocabulary—or make-up either. Wasn't the air free? Wasn't he a licensed opr? Wasn't this the DX period? Didn't I have the same right to call that he did?, etc., etc. Well, I admit that so far as rules and regulations go he was right. I thot at first of doing likewise and call every DX guy I heard. But on second thot I saw the hopelessness of that for his imagination had mine licked to a standstill for besides polluting the air with calls he really did hear, he IMAGINED he heard more calls than there are listed in the "blue book". So what was I to do? I thot of everything from "sitting on my key" to the construction of a QRN-maker to tie on his antenna. Nothing seemed adequate to the occasion, however, and I may as well admit I never have figured out a way to "come back" at the "young squirt." Do I hear some say "capital punishment"? Yes, that might solve the problem but have you ever noticed that nearly every case of QRM of this nature comes from those at that stage of existence called the "tender age of youth"? Such is the age of my "disturber of the peace" but even so he is fully as obnoxious as the most ancient Limburger cheese. So much for the "young squirt."

Now fellows, to get down to seriousness: Those of us who have been in the game since the very start cannot help but see how indispensable is co-operation. We know that without it Amateur Radio would have perished long ago. Even had it existed up until the war, there is no doubt of what would have happened to us when certain illustrious members of our government tried to keep us forever silenced as we had been for nearly three years, had it not been for said co-operation. Yes, we know, but how can we go about instilling that feeling into the numerous "young squirts" who are the bug-bears of today? Can DX relay work ever amount to anything if QRM continues to be so rampant as it is now? Why, I have repeatedly heard stations clearing (or rather trying to clear) traffic only to be held up by interference from some inconsiderate "HAM" in their near vicinity who could not help but know they were working DX. And

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what is the usual text of the HAM's transmission that he deems it more important than MSG's.? Nine times out of ten it is SA OM QSA? QSB? QTC? etc. And there you have one very good example of lack of co-operation.

There is just one more example I want to give before I quit and that is the interference two nearby stations will cause for each other if both try to clear traffic at the same time. I have heard it hundreds of times. It is human nature of course for each one of us to think our MSG's, of more importance than the other fellow's and because of that, about the only way such form of QRM can be minimized is in the method of calling a station to whom a MSG is going. If the rules as set forth in the law would only be followed, we would soon see a change for the better in our traffic conditions. Call the station three times and follow by your own call three times. If you don't raise him the first tme wait three minutes before calling again. If on the second you fail again, try a third time after a three minute period has elapsed. Then if you fail to get him you can feel reasonably sure he is either not on the job or out of your range. Why the three minute period between calls, you ask? To give anyone else in your vicinity who has MSG's. to clear a chance to call *his* station. And now, fellows, should he raise his station,stand by for him until he finishes. It may take longer to clear traffic in a city where there are several long distance men, but you will find that in the end it will make for better relay work and a much better feeling between amateurs—in other words, co-operation.

I have raved enough and so will call a halt. But I want to say just this, that I'm with the majority and what rules are made for the betterment of Amateur Radio will be given my support always.

One of the mob,
9AF.

1NAQ, Hartford, Conn.

Editor, QST:

Not to any small extent during the past few weeks have I heard the phrase "Sorri OM QRM spark coil hr" from several stations in several districts, and it seems very strange that only a few cities can boast of having a clear working period for all concerned. What's the trouble with certain DX men who hope by mere strength of power in watts output to overcome the spark coil? It can't be done that way at all. You fellows who may read this can paste one word in your memory: CO-OPERATION. And DX men have to live up to it as well as the squeak boxes. Don't try to brow-beat the coil, because he will jam back every time and your DX msg. is going to strangle of hook-wormus at the other fellow's station if you don't give that coil a chance. You may think I own a coil. No! Nor do I own a Ford either. But to lay things open for the DX traffic to move smoothly you must give in to those coils because the DX is in the minority. Now under those conditions what are you going to do? Easy—make a schedule giving the small sets the biggest part of the 24 hours, yourselves with power sets a smaller part, and *live up to it yourselves.* The biggest half of the trouble causing QRM is from the DX men who are HAMS, who jump on a set as soon as they can cram a potato and gullup a mug of coffee at supper time, and who hammer the key from then until they have to quit for utter exhaustion. Their usual run is confined to "73 CUL QRK OM QSA QSS" and, of course, "QRM". Now, you fellows in the 8th district especially, who are living in some of the best cities in the world, you who do a disappearing act on said potato and coffee and who at 10:30 or 11 p.m. are crying out "QRM hr OM sorri CUL"—lay off your keys until 10 p.m. and give that young lad a chance. He has got to learn the game, same as you had to, and he is in the majority, so you must pipe down for your own good and for the good of all DX. Get the gang together, all of them, and tell 'em: "Here, you spark coils go to it 6 a.m. to 11:45 noon, 12:15 noon to 9:45, and then "SK". We of the DX class will go to it 10:10 p.m. to 6 a.m." And if you put it up to them right and live up to it yourselves, they'll do the same and your old excuse of QRM will be passe. It's just co-operation all the time that makes DX easy.

You may say "Oh bunk! it can't be done", but somewhere in your city is a man who can organize this schedule and get the co-operation of all concerned, and that man may be you. You don't know until you've tried—and it certainly beats threatening, cutting antennas, etc.

Let's have less of this useless QRM stuff and quicker moving of traffic thru these cities where coils are numerous—*it can be done.*

Yours truly,
J. C. Randall,
Dist. Supt., Northern Conn.

A SIMPLE CIRCUIT.

2048 Fifth St.,
Port Arthur, Tex.

Editor, QST:

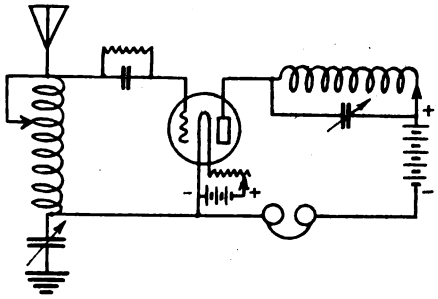
After reading the article "Some Experimental Regenerative Tuners" in March QST I thot I'd suggest a design myself. It has the advantage of only two controls, one for regenerative and one for tuning; it gives excellent amplification, comparing favorably with the variometer sets on the

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Engineering Library

market now; and lastly, it gives good selectivity.

I show the circuit here; note that the plate circuit is tuned. The antenna series variable may be .0005 to .0015; .0005 is all that is necessary as you cannot use a .001 condenser past about 50 on a 180-degree scale and still have good selectivity —past 40 the tuning broadens rapidly. With an .0005 good selectivity can be obtained on readings up to 100 or 120. In the plate circuit use anywhere from .0003 to .0015. I use .001 with good results.



Your antenna inductance depends on the aerial you have, of course, and due to the fact that such a small series condenser is used it will be necessary to tap it about every five turns beginning with the 10th turn. The plate inductance can be tapped less frequently. Eighty turns, tapped every 20 turns, is sufficient for waves from 150 to about 800 meters. The two coils can be wound on same form if desired, if several inches are left between adjacent edges (I use 1½"), and about 3½ inch form is OK. The switches should be arranged to short-circuit the unused turns.

Yours very truly,
L. W. Hatry, 5KN

CORRECTION.

8TY, Jamestown, N. Y.

Editor, QST:

In March QST you say you believe that was the first time QST had a calls list reporting stations from every district. ND, OM: see QST for April, 1917, page 56, 9ZN's list. Also QST for January, 1921, page 50, 9RR's list. Both have stations from every district, and there may be others for all I know.

R. W. Bissell.

FOR THE COMMERCIAL OPS.

Editor, QST. Brooklyn, N. Y.

My dear K. B.—

A few lines in hope to do some good among 600 meter men. You 200 meter chaps who think you have a hard time with QRM, etc., just try standing eight hours on 600 in or near New York. I'm firmly of the belief that half the commercial operators are half-witted. The rest are idiots. Anybody doing this for a living is, as has often been noted, necessarily nuts, or becomes so in short order.

Everytime you call traffic list, either two birds will test on full power in your front yard (no sines,) or three chumps will call you for QTC? (you didn't call them, but that's no matter.) If anyone you did call comes back, he gets swamped. Or you start a fellow about 821 miles south with important message. You just get started when S.S. Yapalaga opens up to say G.N. closing down. If he wasn't open to hear you start another ship, how can he close down, I ask? Or two ships about five hundred miles out, making so much QRM between themselves that they think they are QSN the coast, will chew the rag an hour patching up NAA between them, and exchanging copies of their TRs and messages on file, so the first one who hears the beach will clear both. "'See you in the morning, after breakfast and tell you how I made out." And so on, ad infinitum, ad nauseam.

Were I the boss of a one-man committee having absolute charge of radio I would institute the following:

Install recording devices in key circuit of all transmitters, to eliminate testing, etc., anonymously. Also to see who knows the code and who doesn't.

Isolate the type that sends words twice, or slow, or repeats the whole message unless you ask him to, so the breed would die out.

Take phonograh records of some bird's erratic sending and make them copy it back. (Ever been in court, and had your testimony read back to you? Know how foolish it all sounds? You get the idea then.)

Award one blown fuse (not "economy".) monthly to the guy that uses the most juice and turns in a blank abstract.

Award one defunct Marconi tube to the bird that calls you repeatedly with his detector out, and then yaps for CQ QSR?

Award three brown derbys to the three best operators on the coast. They would go every time to "HQ" (Munson Line,) "WE" (United Fruiter) and

Yours truly
"WE"—WC G.

A REACTANCE-COUPLED AMPLIFIER

342 Union Ave.,
Laconia, N. H.

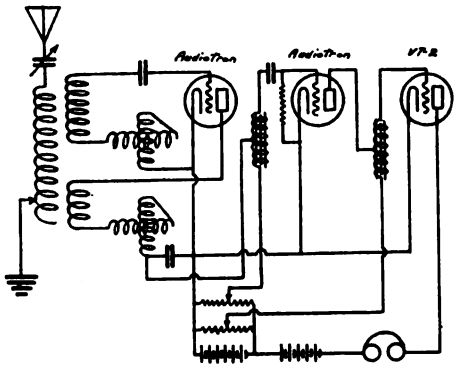
Editor, QST:—

I am enclosing a diagram of the hook-up I am using for amplifying, and as I have never seen it published or known of its being used it may be worth publish-

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ing as it works better than anything I have tried yet. A one-step like this will give as loud signals as an ordinary two-step.

About the only difference from the usual is the use of an auto-transformer for coupling the tubes. This makes possible the obtaining of out-put and input impedances correct for the tubes used. The amplification is obtained from the turns-ratio, the small amount of wire used, and the lowest copper loss. In my case I am using a single B battery for all three tubes but a separate battery may be used for



each if desired. Also I am operating the 1st step on the lower bend of the tube curve with low A and B batteries, and the 2nd tube on the straight portion of the curve in the regular way. This does not seem to distort radiophone speech quite as much as the regular transformers.

I can see no objections to auto-transformers but there may be some I have not found and I would like you opinion.

Hope you may find use for this little bit of dope.

Yours truly,
H. R. McLane, 1CM.

LETTER FROM FRANCE.

Nice, Nov. 9th, 1920.

My dear American Friends,

I have been asked again to write a "Letter from France" for "QST" and I gladly comply with that demand hoping that the information I can give you about the state of affairs concerning the radio Amateur in France will interest you.

In my previous article written on the 22nd of January last I was expressing the hope that a new and more liberal regulation of amateur activities would soon be put in force. At that time we all thought that reception at least was about to be officially permitted and that perhaps even transmission would be allowed to a certain extent. Personally I had founded great hopes on the optimistic views a high rank army officer had expressed to me some time before.

Well, the regulation came in February and was a great deception to all radio enthusiasts!

According to that regulation the erection of receiving stations alone can be allowed and these stations must be intended exclusively for the reception of time signals and meteorological information. To obtain this permission a demand must be addressed to the Director of Posts and Telegraphs of the region in which the station will be installed and if this locality is less than 50 kilometers distant from a frontier or from the sea-shore, a special permission must be obtained from the Military or Naval authorities. In the demand of authorisation a complete description of the station must be given and no change can afterwards be made in the apparatus used without special permission to do so. Besides all this, much unpleasant official formalities have to be gone through. The annual tax is five francs.

Some well informed law specialists think this decree of the Ministry of Posts and Telegraphs is not lawful.

But if the above regulation is very strict, fortunately it is not at all strictly enforced, as you will see by the following which is a translation of a paragraph which appeared in "L'ONDE HERTZIENNE", a French radio magazine.

"According to the answer made by the Under-Secretary of State for Posts and Telegraphs to Monsieur Berthon, a Deputy, (Journal Official of April 3rd, 1920) the above decree has been taken in order to establish a very simple regulation for the granting of licenses for the erection of time signals receiving stations. As there is no possibile means of ascertaining that a station is meant only for the reception of time signals, the Administration must necessarily accept the declaration of the applicant and only compel him to make no use whatever of messages which he might overhear by radio."

As you can imagine from the above, reception is still going strong in France. The QRN have been very bad during the summer but diminished considerably and abruptly a few days ago and listening in is once more a real pleasure. When I tune down to 600 meters I seldom wait long before the high pitched spark of some American ship comes in, usually very QSA, and I often think of a time, previous to the war, where, except for the warships who had came to Villefranche in 1913, I had never heard a single American ship work by radio. Times have fortunately changed and it is a great comfort to see that the bonds of friendship which have developed during the war are everlasting and to hear the talk of the mysterious aether waves say that young America has not forgotten the road to the shores of her old friend France.

(Signed) H. T. S.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of QST published monthly at Hartford, Conn. for April 1, 1921.

County of Hartford } ss.
State of Connecticut }

Before me a Notary Public in and for the State and county aforesaid personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Radio Relay League, Inc., Hartford, Conn.; Editor, Kenneth B. Warner, Hartford, Conn.; Managing Editor, (none); Business Manager, Kenneth B. Warner, Hartford, Conn.

2. That the owners are: (Give names and addresses of the individual owners, or, if a corporation, give its names and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock). The American Radio Relay League, Inc., an association without capital stock, incorporated under the laws of the State of Connecticut.

3. That the known bondholders, mortagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If they are none, so state). Hiram Percy Maxim, Hartford, Conn.; John S. Dunham, Brooklyn, N. Y.; C. D. Tuska, Hartford, Conn.; W. S. Browne, Brookyn, N. Y.; C R. Runyon, Jr., Yonkers, N. Y.; Nicholas Roper, Youngstown, Ohio; Chas G. Godfrey, Bridgeport, Conn.; Frank Conrad, Pittsburgh, Pa.; F. M. Bookwalter, Springfield, Ohio; Chas. A. Service, Jr., Bala, Pa.; Miller Reese Hutchinson, New York City; George M. Woodcock, Buffalo, N. Y.; C. Tefft Hewitt, Swissvale, Pa.; Leonard D. Fisk, West Hartford, Conn.; H. E. Rawson, Chicago, Ills.; Emma Candler, St. Marys, Ohio; Chapman Printing Co., Hartford, Conn.; Robert F. Gowen, New York City; E. C. Wilcox, Meriden, Conn.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is..... (This information is required from daily publications only).

K. B. Warner

Sworn to and subscribed before me this 14th day of March 1921.

Wm. Lacey Wells, Notary Public
(My commission expires February 1, 1925.)

5EJ, AUSTIN, TEX.

(*Concluded from page 40*)

two-step, and Baldwin phones.

5EJ, has been reported from Canton, Ohio, Sioux Falls, S. D., and as far south



as Guatemala. Relay traffic is regularly handled at the rate of about 50 messages per month.

THE SIGN of a GOOD RADIO MAN!

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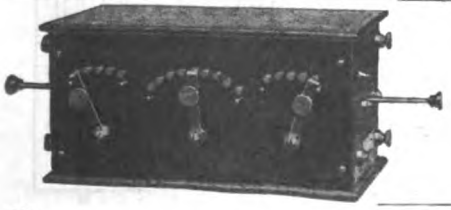
"Radio Engineering Principles"

By Lauer & Brown

300 pp., 6x9. Price, $3.50 postpaid.

Ask any amateur who has read it and he will tell you it is the book you need. We recommend it.

Q S T, 1045 Main St., Hartford, Ct.



GETTING PHONE CONCERTS?

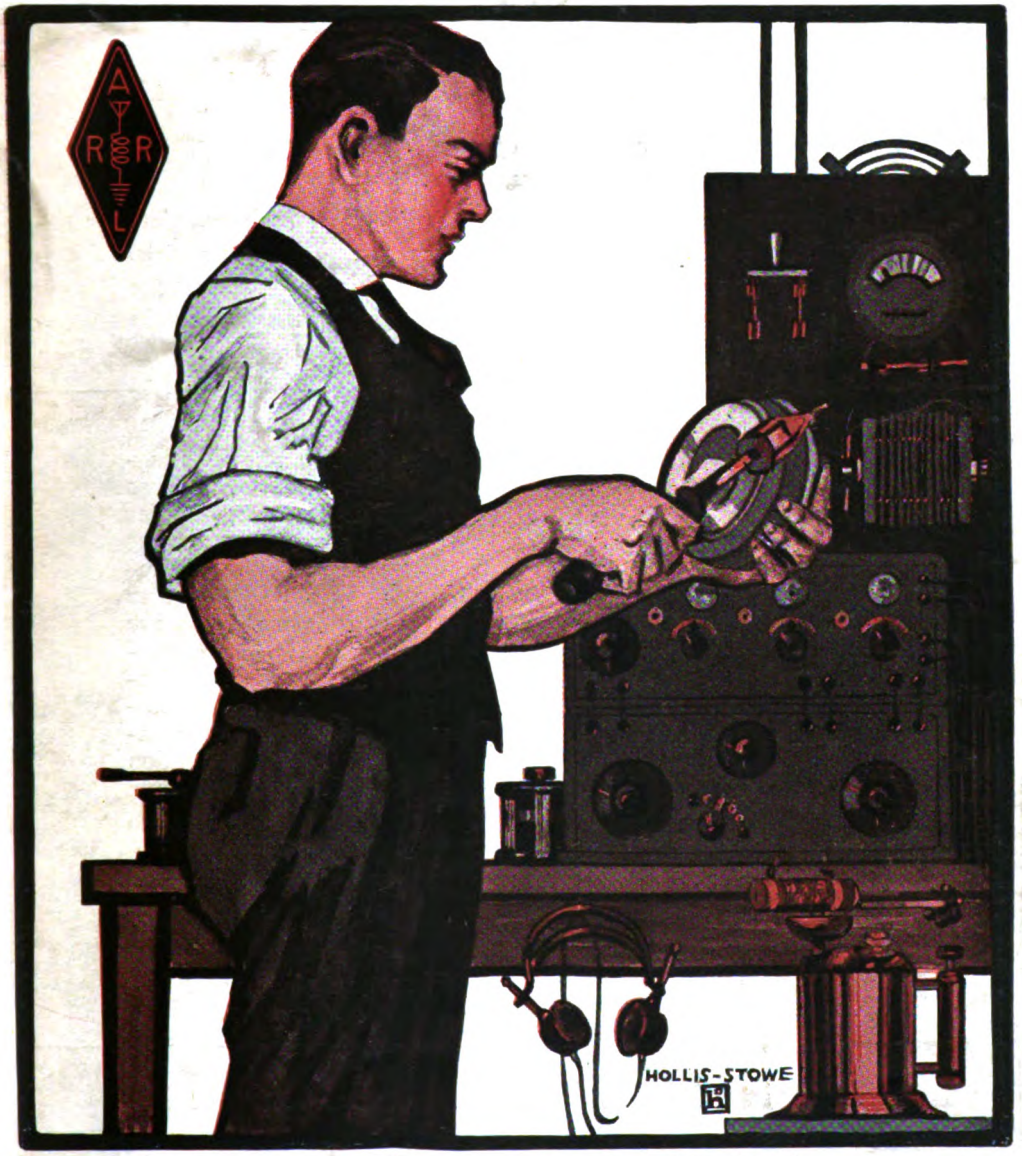
This Regenerative Tuner gets them O. K. as well as all other 200 to 600 meter stations. Mr. F. H. Calhoun, Charlottesville, Va., says: "Regenerative Tuner working fine." Send a 2 cent stamp for bulletins.

Colby's Telegraph School, Auburn, N. Y.

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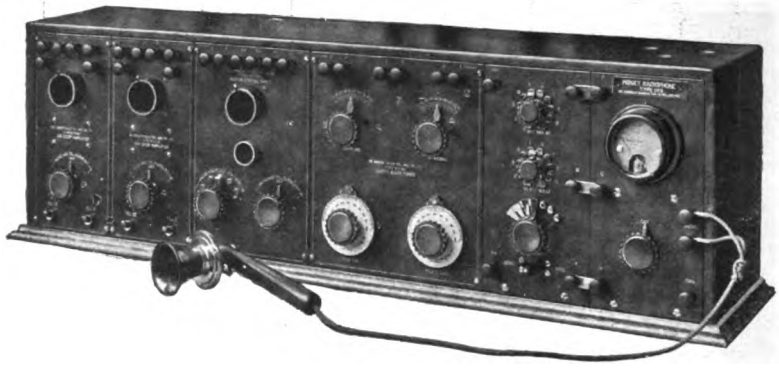
A Magazine Devoted Exclusively to the WIRELESS AMATEUR



Published by the American Radio Relay League

JUNE 1921

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QST

The Official Organ of the A.R.R.L.

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HARTFORD, CONN.

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"A national non-commercial organization of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, and for scientific growth."

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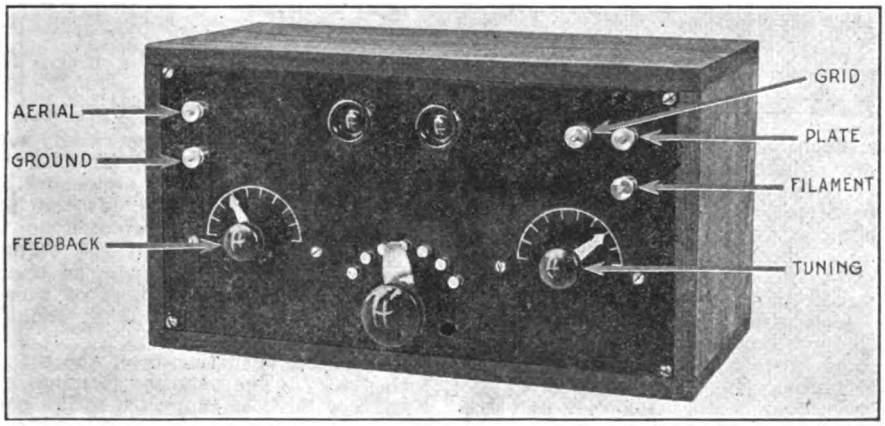
QST

A Magazine Devoted Exclusively to the Radio Amateur

A Receiving Tuner for C.W.

DO you believe it possible that C.W. can be tuned in much easier than spark? Accustomed as you are to the modern regenerator with its multi-controls, where the plate circuit has to be carefully tuned to the grid circuit and then retuned each time the grid circuit is varied, to say nothing of critical adjustments of antenna circuit and coupling, no doubt it sounds improbable, and indeed it is a hard job on our regenerators. But can you imagine a tuner that would oscillate nicely at whatever wave length the grid circuit was tuned to, and in which the aerial circuit and coupling didn't have to be adjusted at all, so that all that would be necessary would be to start it oscillating and vary the secondary and then be able to hear the C.W. stations as you pass their waves, be able to stop without effort on any of them or to switch almost instantly back and forth from one to the other and find them always in the same spot, and all totally free from capacity effects? A set that does these things has been devised by Mr. John L. Reinartz, 1QP, of South Manchester, Conn., and forms the basis for this article.

C.W. transmitters have been progressing faster in recent months than C.W. receivers, and the difficulty of tuning it in has been holding back development. Our regenerative tuners, expressly designed to work almost but not quite up to the oscillating point, are being found unsuited to C.W. reception because of the length of time required to perfect the various adjustments on a given signal. Most of the circuits finding favor for receiving C.W. employ a capacity feedback in one form or another, rather than the tuned plate circuit, which former gives stable oscillation over a wide range of secondary-circuit wave lengths. The new Westinghouse tuner with its tickler feedback and with variometer and condenser on the same shaft, is also very convenient for C.W. The tuner described below can be built by any amateur at a trifling cost, and altho C.W. is its *piece de resistance* it is almost as

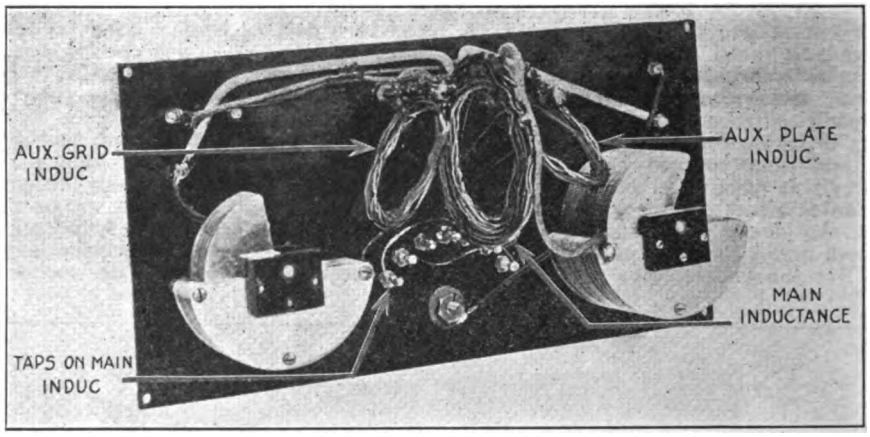


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good as the tuned-plate-circuit regenerators for spark work.

The photographs show the outside and interior of Mr. Reinartz' tuner, and the hook-up (with an extra switch, to be mentioned later) is shown in the schematic diagram. The main inductance TL is a home-made "spider-web" type with a 2-inch center hole, wound with No. 22 cotton-covered wire with turns and taps as shown in detail under the hook-up, the taps being made by making long loops at the proper turn, baring the wire and soldering close to the winding, and continuing. Now this main inductance is the only one entering into the actual tuning of the set, and the feedback is primarily by means of a condenser, but difficulty is experienced in making such a circuit oscillate at very short wave lengths and for this reason two auxiliary inductances are introduced into the circuit to give a greater measure of coupling between grid and plate circuits. These are indicated at T_1 and T_2 and consist of 25-turn coils of construction similar to the main inductance but without taps. If the constructor desires, these coils can be made by "jumble-winding" the proper number of turns on a 2-inch tube, taking off, and taping. In the set illustrated the spider-web form was followed, and the shape of the coil preserved by applying a little sealing-wax at various points to stiffen it. The auxiliary inductances are mounted on each side of the main one, by fastening them with sealing wax to short shafts actuated by the two small knobs at the top of the panel. Their coupling, therefore, is via the main inductance. There is one adjustment of these couplings that will be found best for a given aerial and tube adjustment, and when once secured the coupling need never be disturbed.

TC is a 23-plate condenser for tuning the secondary circuit. The set shown in the photographs has no taps on the secondary and this condenser is therefore the sole means for tuning it. However, Mr. Reinartz finds that somewhat better results are obtained by having a few taps on the winding so that more inductance can be used and less capacity be necessary for reaching the longer waves. Accordingly a switch TS is shown in the hook-up, and is the right-hand switch in the detail drawing of the main inductance. GC is a 43-plate variable grid condenser, which is often an advantage over the fixed grid condenser altho very good results are obtained with the latter. RC is a 43-plate variable to control regeneration. The 7-point switch AS varies the aerial circuit inductance, which is part of the main inductance and therefore very closely coupled to the secondary winding, from 1 to 12 turns. This is the switch appearing in the lower center of the panel. If the 3-point switch TS is added, the two switches could be placed side by side at the bottom of the panel. The detail drawing of the main inductance shows the number of turns between each switch-point and should be carefully followed.

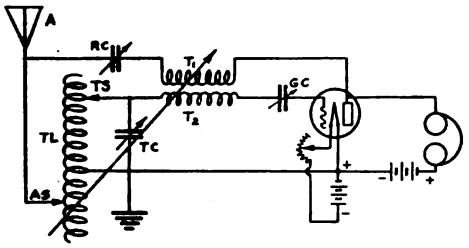


The initial adjustments of the set are a little tricky. The negative terminal of the B battery *must* be connected to the positive terminal of the A battery, and this point grounded. When an amplifier is used the grid circuits of same should connect with the negative side of the A battery. The polarity of the two tickler coils must be right—they will work in one direction and not in the other.

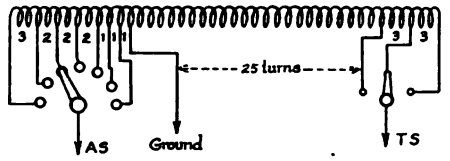
On an average amateur aerial the set will tune from 150 to 450 meters and will regenerate or oscillate over the entire range. It requires a somewhat greater detector filament current than is necessary for the same tube in a tuned-plate-circuit regenerator, and if results are not at first obtained, the filament should be crowded

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a little. Tune with condenser TC and regenerate with condenser RC. Turning RC a little past the regenerative point, the bulb will oscillate, independent of the aerial circuit adjustment, and its frequency will depend substantially on the secondary cir-



Details of Tuning Coil TL



cuit adjustment, so that the latter may be varied thruout its range with the bulb oscillating nicely at every wave length. The primary circuit acts as if it were aperiodic and probably functions purely thru shock excitation, as its adjustment has very little effect on wave length. On the first tap the set tunes very sharply, there being but one turn in the aerial circuit, and will accurately measure incoming waves if calibrated, while on the seventh tap the tuning is quite broad for C.W. In general the first tap should be used for very short waves and the third for the higher waves. With the bulb oscillating, C.W. signals will be heard when the local frequency differs from that of the incoming signal by an audible beat note. It is fairly easy to stop on any desired signal, and the condenser RC provides a fine adjustment for varying the note to any pitch desired. The movable plates of condenser TC are connected to earth, while the aerial connection to condenser RC is made to the movable plates, with the result that no capacity effects from the operator's hands are noticeable.

This circuit is equally adaptable to long wave receivers by making TC of the proper size, and is a very fair transmitter. With the detector bulb oscillating a key or microphone may be placed in the ground lead and local communication had without difficulty.

Mr. Reinartz kindly volunteers to answer any questions concerning the set. A stamped addressed return envelope should be enclosed with communications.

Rotten Nerves

By The Old Man

'Salmost too good to be true, fellows, but after many months of silence we have again heard from our mysterious friend, T. O. M., and just as we suspected he has been fooling with this C.W. stuff. Read it and weep.—Editor.

WELL, son, it is some moons since I have taken this pen in hand to write you about things that are rotten. I reckon there have been a plenty of rotten things to write about, what with the income tax and trying to get a C.W. set to work, but it has not seemed safe to venture. Lord Helpus, but I could tell some things that are so rotten they would bring tears to the eyes of a cigar store Indian but, to be honest, I don't dare. I've lost two of the best friends a man ever had, darned near got divorced twice, burned myself with the high voltage D.C. stuff until my hands hurt all over, and set fire to the house twice, trying to get one measley ampere of C.W. into the antenna. When our nerves get steadied and it is safe to make a few comments without starting a fight maybe I will dare tell about it. It might be funny six months from now, but at date it would probably incite somebody to murder.

You know, son, I have it figured out that this radio business gets your nerves after a while. We radio bugs are rapidly becoming temperamental, like a lot of opera singers. I never saw such a hair-trigger lot of folks as a class. I am going to organize the N.W.C. (Nervous Wreck Club) and make myself president of it and get cheap rates at some sanatorium where there is a chance to put up a wire in the air. Then maybe we can kill or cure ourselves and get along with less wrangling over small points. Why I have seen the time when nerves got so on edge that close friends have had to be separated in an argument whether Beeman's Pepsin was or was not better than Wrigley's Spearmint. We work so blamed hard and we want what we want when we want it

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so passionately, and we sit up to such deadly hours at night and take so little sleep that we just naturally get edgy and jumpy. It takes less to start a row among radio bugs than in any other class of people on earth, I reckon. Sometimes it gets downright funny, if you have a sufficiently sensitive bulb in your sense of humor, but during the heat of the argument it is far from funny. The funniest case of nerves yet recorded happened here



....organize the N. W. Club....and get cheap rates at some sanatorium.

the other night, and I think the parties involved may stand for a recital of it. I have carried a smile around on my face for a week thinking about it and by Heck I believe I will break my long silence and tell it to the gang.

It was one of the many by-products of our C.W. experiments. C.W. has a good many by-products, as some of the fellows well know by this time. You all remember our Radio Club, and Final Authority with his glasses, Radical with the eternal chip on his shoulder and the direct way of going at things, and our husky President with the determined manner and the strong right arm. Well, as per usual, Final was the goat. Final always was considerably touchy as to nerves. It never took much to scare him. He was always strong on theory and weak on the practical things of life. When anything got to turning over faster than 2500 r.p.m. Final was for stepping one pace to the rear and wrinkling up his finely chiseled brow in expectation of the worst happening. He belongs at a receiving set and not where the machinery is noisy and moving fast. Radical, on the contrary, has no nerves. They ran out of nerves when they built him. He fears neither man, devil, nor the Radio Inspector and has an insatiable desire to feel of everything with his bare hands. The more noise it makes and the more fire it vomits the better he likes it. He keeps your heart in your mouth most of the time, when he is loose in the vicinity of a transmitter. With C.W., where it is an easy thing to get a jolt that will kill you, he makes me nervous and jumpy. It was Radical who taught me you could grab hold of the lead in when you were transmitting, provided you grabbed in real man fashion. He gave me palpitation once when he grabbed my lead-in one night when I was working my one k.w. Thor on full power. He says if you grab hold good and solid it only prickles, but if you dally with it any it bites a piece out of you. Old Kruse down at the Bureau of Standards ought to make some researches into this.

Final, Radical, the President, Yours Truly and Final's Dad were all assembled in Final's cellar not many nights ago, trying to find where the daggone C.W. juice was going to that ought to have been going up the antenna via the hot wire ammeter. There was a bunch of stuff laid out on a table, and a mad tangle of wires and instruments and things lying around all over the place. Final knew where things went, but I had not the remotest notion and I am blessed if I believe either Radical or the President were much better off. On the floor directly back of them was an A.C. motor coupled to a D.C. generator, both of which had seen better days. The coupling was a huge monstrosity of cast iron, leather disks, bolts, nuts and rubber tape. The rubber tape was depended upon to hold the business together. A couple of big U tubes were mounted upon the table among the maze of wires and if you were an acrobat you could stand between the table and the motor-generator set and make readings of a milli-ammeter, and not get the seat of your pants chewed up by the couplings. The plates in the U tubes were white hot most of the time and threatening to burn out and bring financial ruin upon their owner and the D.C. commutator on the poor miserable generator was screeching bloody murder and spitting blue fire, and the evil coupling between the motor and the generator was snarling and snapping something dreadful. Under the circumstances it may readily be imagined that there was an air of nervous tension pervading that cellar.

Final's Dad had been attracted to the cellar by the racket and the smell of brimstone, as he put it, and was an interested observer. He carried around with him a sly little twinkle in his eye and I had a hunch in the beginning that he might be up to something. Dad is a real dyed-in-the-wool sport. He is not a whole lot older that I am, and drinks home brew and plays poker Saturday nights with a gang of his age. He made you wonder how such a real he-man ever could have such a nervous young lady for a son as Final. I think he has wondered at it several times

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himself. Final's Dad regards radio from the same slant that he regards hunting, fishing, base ball and prize fighting. If it is a case of sitting silently at a receiving set for a few hours he gets sleepy and loses interest. But if there is something red hot and making lots of noise and offering chances of busting up, he is Johnnie-on-the-spot. So Dad stuck around on this evening, watching the D.C. fireworks and listening to the snapping coupling with admiration. The coupling blew up several times during the tests and scattered cast iron and bolts and nuts and leather disks over the face of Nature, and Dad thought it fine business. Final tried to explain to him the formula governing centrifugal force, and how unhealthy it might be to stand in the plane of rotation of the coupling when it busted, but Dad could not take it in. Once or twice he slyly kicked the generator bearing with his foot, hoping, I honestly believe, to make it bust again.

It was getting late and we had been there some time working hard making adjustments of inductance and capacity and cursing Colpitts for ever getting up such a circuit, and getting just exactly nowhere, when Dad passed me a wink and we drew apart from the young men and went up stairs and took a couple of bottles out of the ice box. After emptying them and lighting two fresh stogies and hearing about how he mixed his hops and his malt extract, and when to add the yeast, we returned to the cellar to see how the coupling was getting on. Radical sniffed frankly and asked us how we got that way in these dry days, but went on rowing with Final about the effect of large capacity and small inductance, the latest article in QST by Warner to the contrary notwithstanding. This was more or less tiresome to Dad and he strolled around the cellar blowing great clouds of smoke from his free burning stogie. There was a big piece of about number twenty gauge sheet iron on a bench and Dad felt of this and reflected. Standing over against the other end of the bench was a big brute of a crow bar. Dad looked at the crow bar and at the sheet iron and seemed to be sunk in thought. I caught him steal a glance at the three young fellows bending over the instruments on the bench, but I looked away in time not to be caught watching. I guessed the old boy with the twinkle in his blue eyes was up to something, but I never dreamed what it turned out to be. I smile now as I reflect upon how skillfully he hatched his plot.

Final and Radical and the President had decided to try an entirely new kink and Dad came back to look on. He stood eyeing the crazy coupling for a while and whether he did something to it or not, I don't know, but anyway she gave a savage slap and with a terrible roar busted again. Final as usual nearly jumped out of his skin and everybody dodged the flying hardware. I put in a bid to stop long enough to fix the blamed thing up right, but the younger fellows vetoed my motion. Just like young fellows, they did not want to stop long enough to fix anything. Their nerves were on edge and they wanted results. Dad butted in here and took my side. He pointed out the obvious fact that rubber tape was not the best thing in the world with which to fix a coupling which had to revolve at the tremendous speed of 7000 r.p.m., the point where Final said the generator must run in order to get the plate voltage which theory demanded. Dad also pointed out the effect of getting hit in the bean with one of the half-inch nuts. He seemed to think it was taking chances. He said the darned coupling shook and rumbled too much to suit his taste and that he considered it an altogether grossly disreputable piece of machinery. It might go off any minute and kill them all right there in their tracks and muss up the cellar. He said it always made a fizzy sound before it busted and he did not believe in a machine that made fizzy sounds. He considered that a very bad sign. He had heard of a fly wheel that had busted once and had killed most of the inhabitants



Dad let loose the most blood-curdling yell in him.

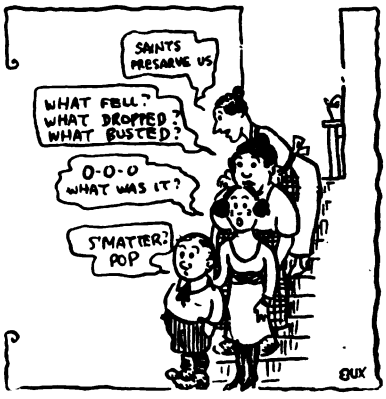
of the town, cutting off arms and legs and heads regardless of consequences. This crazy coupling was likely to explode the same way and send them all to Kingdom Come. He grew eloquent, and I could not help wondering why he was laying it on so thick. I found out later he was engaged in setting his stage for the big show he proposed to pull off in a few minutes.

Final and Radical and the President took his words partly to heart. They spent fifteen minutes putting back the bolts and nuts and leather things, and got some new tape and wrapped it around good and

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thick and then wired it down so it would not come unstuck. Then they cleaned and adjusted the business end of the D.C. generator and started in once more to take readings with the new circuit. I got interested and watched them closely. I took note that Dad was over by the sheet iron and the crow bar, but I did not pay much attention to what he was doing. While we were at our busiest he came over and let out a holler right back of us to look out. The coupling was fizzing again. Final thought something had let go somewhere and nearly jumped through the ceiling. Radical himself gave a jerk. He was getting screwed up himself after all the trouble and the talk by Dad. I confess the yell brought me up all standing too. My nerves were as edgy as anybody's. They decided the fizzy sound did not portend anything serious and we went back to changing the capacity and the inductance and taking readings. We were right in the middle of the last combination when there came the most blood-curdling gawdawful yell I ever heard from a white man. Following it immediately came a perfect whale of an explosion and crash. It was right back of us, and of course all hands thought of the coupling and what Dad had said. Well sir, you never heard such a goldarned ripping and roaring nor saw such a mix up in all your born days. I went clean over the motor-generator set and landed out in the cellar floor. Every nerve in my body was taut as a fiddle string. Gasping for air, I glared around wildly to see whatinhel had got adrift and where the heavy parts were likely to come down. I remember being surprised when I looked up and saw that the roof was still on. I expected to see the stars above me. My mouth tasted of copper. It always does when I get a real sockdolager of a fright. I suppose my eyes blazed and my hair stood up. I acknowledge I had the fright of my life. What between the hoarse yell and the terrific explosion, and the state of my nerves, I thought the biggest bust-up America had ever figured in was right here in town.

Final happened to be leaning over the instruments and he projected himself half way over the table and lit in among the bulbs and wires and odds and ends. He had jerked so when the bust-up happened he had bumped Radical in the jaw with the milliammeter. Radical said later he thought one of the hunks of cast iron had lit on him. He knew he was mortally wounded because he could feel the hot life-blood flowing down his chin. He was convinced his jugular vein had been severed and that he was bleeding to death. He had recoiled sideways and had caromed off the President and was heading in the general direction of the coupling. He said he had visions of sitting down hard upon the rapidly rotating remains. To save himself and the seat of his pants he had made a frantic grab at the President in passing, and had hooked into him somewhere. The two of them got mixed, the wires connecting the instruments they were holding pulled taut and snapped, and these two agile young men went into a tail spin. They spiralled and side slipped and executed the darndest hootchie-cootchie you



By this time Final's family had poured down the stairs.

ever beheld trying to make a landing elsewhere than on top of the coupling, which they both knew was directly behind them. Goshamighty, I never imagined such a whirling around of things and people!

When Final got himself unsnarled from the tangle of wires and instruments and settled down out in the middle of the floor, all he could do was to jitter. He held tight hold of a miserable bit of insulated wire. What he thought he was going to do with it I give up. After gazing wildly around and muttering incoherently he looked hard at his Dad. By this time I had caught on. My nerves were unstrung, but I could understand things. Not so Final. He was in a beastly state of funk. Radical was looking at the coupling which was running still and entirely normal, or as near normal as it ever was. I saw at once that Dad was standing over by the big piece of sheet iron, and was having an awful time trying to control himself. His blue eyes were twinkling away like stars. The big crow-bar rested upon the sheet iron and a big welt showed across the full width of the latter. Dad had taken the crow-bar, lifted it high over his head, let loose the most blood curdling yell in him, and had brought the crow-bar down on the sheet iron with the huskiest wallop he could command. The whole thing was as plain as the nose on your face.

Final could not grasp anything. His nerves were shattered. He could see and

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also hear the coupling running, but he was so sure of his theory that it had busted that he did not take into account what his eyes and his ears showed. The noise and the yell told him something big and dangerous had let go and as the coupling was on his mind it must be the coupling that had busted. His face was pale green. You could see that every nerve in him was raw. He jittered something and staggered over toward his Dad. The two of them looked hard at each other at close range for what seemed five minutes, and then the following edifying conversation ensued, each one yelling at the other in order to be heard above the racket of the coupling. (As yet not a one of us had the brains to shut off the motor-generator.)

Final jittered, "What hap—you—did some—where—?"; to which Dad replied, "Sure." Final glared around to see if anything heavy was coming his way, and still clinging fast to the bit of wire, said, "What was — where — I — Gosh!" Dad thought this over and came back with "Yes, that's right." It seemed like a perfectly good answer to Final. He asked then something like, "What was it—why is — you — yell — where—my head aches." I don't know how long they would have kept this drool up. Radical saw they were getting nowhere, and as customary with him he came right to the point. He walked up to Dad, and looking at the sheet iron and the welt across it and the crow-bar said, "What for gawdsake happened?"

By this time Final's younger brother and his pretty sister and the hired girl and his mother had poured down the stairs into the cellar. Mother was trying to make up her mind whether to be frightened or mad. She demanded to know what had fallen down and broke. You could see she was in doubt between some wireless bust-up or some home brew bust-up. Pretty sister was frightened and expected to see blood and gurry scattered around. Young brother thought it great stuff and searched for some sign of the explosion. The hired girl was all of a tremble and eyed me with open suspicion. She had seen Dad and me with the bottles earlier in the evening. Radical had the brains to shut off the motor-generator at this point and as the thing dawned upon him he began to laugh. Dad explained to the assembled multitude that they were conducting some new wireless experiments and once in a while it made some noise. No one had been chewed up and the family would please go back upstairs. The experiments were over and they would all be stopping pretty soon now.

Final looked around vacantly after the crowd went, and no one seemed to want to fool with C.W. any more that night. Everybody's nerves were pretty well frazzled and so we went home. On the way home with Radical the latter chuckled to himself every minute or so and when I dropped him at his house he grinned and allowed as how a rattling good time was had by all, and that Final's Dad was some radio bird. I don't know when we will pick up the Colpitts matter again. I am going to lay off a while until my nerves get straightened out and my fingers get well. Somebody says to cut out the motor-generator idea and use the sixty cycle juice on the plates. But if it can't be made to drum and grunt less than what I have heard in the air coming from those hooligans with the five watt tubes, I shall stick to the motor-generator. But when it comes to coupling up an A.C. motor to a D.C. high voltage generator, I shall fix me up something that does not have to turn up to 7000 r.p.m. and make a noise like a drunken pneumatic hammer badly out of repair. But by Heck it will not be until I have taken a week to rest up my nerves.

The Ideal Relay Spark Station

By R. C. Denny, 6CS

In two parts: Part I.

This is the Second Prize article in QST's contest for practical material on spark sets. As we stated in our mention of the subject in April QST, we cannot fully subscribe to some of Mr. Denny's views, and attention is asked to the notes at the end of the article. We frankly admit that many of these questions are matters of opinion and we do not wish to disparage Mr. Denny's article, which is excellent and in the constructional data it contains in particular will be welcome information to many of our readers.—Editor.

The Mast

It is generally conceded that the high vertical aerial is the most successful for transmitting the greatest distance with a given amount of power. Then, since the ideal relay transmitter should cover the greatest possible distance with the rather limited power of 1KW, a vertical aerial system should be the choice for such a station. Inasmuch as the natural wavelength required in an aerial for 200 meter transmission should be 160 meters, or an

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electrically equivalent actual length of 100 feet, a mast or tower of that height would be required for a truly vertical aerial. The construction of a single mast or tower and vertical aerial of the same height would be impractical, as it would be difficult to insulate the aerial from the mast and from the guys. To build two or three masts to get sufficient clearance for a vertical aerial of the same height would prove costly, and require considerable space. However, by sacrificing say 25% of vertical height (and it is doubtful if this would reduce the transmitting range appreciably) it is perfectly feasible to suspend a 100 foot aerial from a 75 foot mast or tower, and get plenty of clearance. A minimum of space is required for erecting and guying a mast or tower of this sort, and that is the principal restriction at most locations.

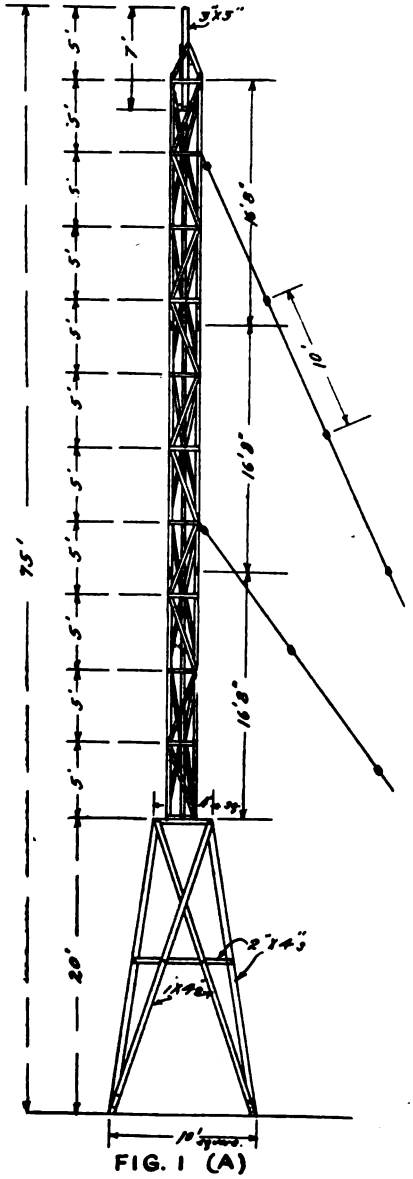


FIG. 1 (A)

The following description of a triangular section, latticed tower is taken from an actual amateur installation, shown in the accompanying photograph entitled "95 Foot Amateur Aerial". In this particular case the tower sits on the roof of a building 20 feet high, but this fact does not alter or in anyway affect the design. It will be seen from the accompanying triangular section drawings that the tower is 50 feet high, and that it rests on a square structure 20 feet high. The triangular tower is built entirely of 1" x 2" material, which may be clear soft pine or spruce. It is made in three sections which are bolted together as shown. (Fig. 1.) The strut members should be fastened to the vertical members with round head wood screws, as they hold much better than nails and are not so likely to split the wood. The braces should be sawed to fit and screwed in place to the vertical members. The pole at the top is a 3" x 3" seven feet long, which projects from the top 5 feet. Through the top of this pole is fastened the eye bolt, which holds the single sheave galvanized iron pulley. The square tower is a 2" x 4" structure 20 feet high, braced as shown with 1" x 4" pieces. The legs are spaced 10 feet at the bottom and taper to 4 feet at the top. There is ample space within this square structure for the radio station if such be the desire of the builder.

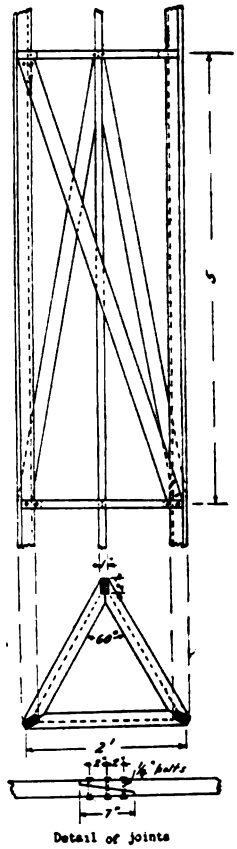
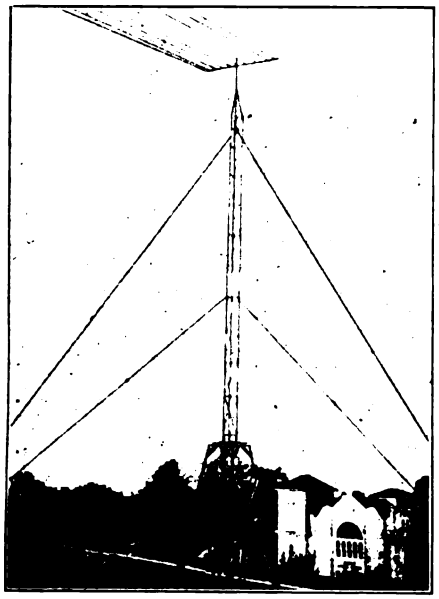


FIG. 1 (B)

There are two sets of guys, three wires each; i.e. guyed in three directions out 35 feet from the foot of the tower. It is not

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absolutely necessary to guy out that far, but in general the farther out the better, depending somewhat upon the character of the anchors. They should be in the ground very firmly, as heavy winds exert a con-



95 Ft. Amateur Aerial

siderable pressure on such a tower. The guy wires are of No. 12 galvanized iron, and are insulated every ten feet by a heavy porcelain knob. The idea of this insulation is to break up the lengths so that they will not absorb energy from the aerial and set up oscillations at anywhere near the normal wave length. It is a good idea to paint the tower, and this should be done with the three sections apart, so that the joints get a coat also. Probably the easiest way to erect this tower is to stand the three sections on end inside the square structure, and having run a 150 ft. length of heavy sash cord through the pulley, boost a section up through the top. Fasten on the top set of guys and bolt to the second section; then boost again, and bolt on the third section. Fasten on the second set of guys and give the final boost, allowing the tower to rest on top of the square structure. The tower shown in the before mentioned photograph was erected in this manner, requiring three men to handle the guys, and four to boost and lift on the tower. The photograph entitled "75 Foot Commercial Aerial" illustrates another application of this same style of triangular section. tower of the same general dimensions, one of two supporting an inverted L aerial.

The Aerial

The arrangement of an aerial on such a tower as described depends somewhat upon the location of the operating room. If at the base of the tower, as is often the case, the wires should be fanned out between two of the sets of guys, and guyed out by means of marlin twine. They are then brought back together at the base of the tower as shown. (Fig. 2.) The more nearly vertical an aerial, the more wires there will be required to obtain a given capacity, owing to the decreased capacitance to ground in a vertical system. However, by using more wires than are ordinarily used in a flat horizontal aerial, and spreading them out over a great area, sufficient capacity may always be obtained. Stranded or braided copper wire may be used with very beneficial results; however, solid copper wire of the larger sizes, No. 12 or 14, is generally very satisfactory. All connections should of course be soldered, and it is very good practice to lay out each wire of sufficient length to reach the apparatus, so that the lead-in may be formed by simply twisting all the wires into a cable. A single wire might be brought in on the opposite side of the tower from the multiple aerial, and used for receiving. A single wire so nearly

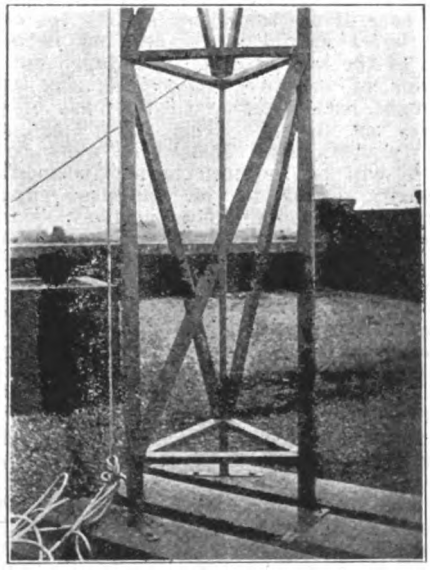


75 Ft. Commercial Aerial

vertical would have very little capacity, and the tendency for static charges to collect would be nil. Very little if any induction should be noticed on an aerial such as described. Neither will such a

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system interfere with telephone lines in the vicinity to any extent, when trans-



Detail construction of wooden triangular section tower.

mitting. A glazed porcelain tube or corrugated composition bushing of some sort should be used for the entrance of the lead-in. It is a wise precaution to provide a ground switch especially in localities where electrical storms are prevalent. This should be a single pole double throw knife switch, of 60 to 100 amperes capacity, mounted outside the operating room, and on some other material than slate, which absorb moisture. The switch should be of such dimensions that there is no leakage or brush discharge from the center stud to the ground clip while transmitting.

The Change-Over Switch

This may be either a single-pole double-throw or a double-pole double-throw switch; in either case it is generally provided with an extra blade to start the spark gap motor operating when thrown to the transmitting position. It should be a quick operating device, and conveniently located, preferably just back of or at one side of the sending key. This switch also should be of sufficient dimensions to prevent sparking or brushing across from aerial to ground connections, and should have large surfaces in the clips. A good simple design of such a switch is shown in the accompanying drawing, Fig. 4, which is self explanatory.

The Ground

The best ground connection that most amateurs have available is the water pipe. This is not a bad ground at all, if a clean tight contact of considerable area can be made close to where the pipe enters the ground. Ground clamps should be used for this purpose, making sure that the pipe is absolutely clean. A heavy copper wire or cable should be soldered to the clamp, and led by the shortest possible route to the apparatus. Precaution should be taken to ground gas pipes, by bonding them to the water pipes at several points, so that no difference of potential exists to cause sparking and possibility of fire in event of a gas leak. Very good grounds have been made by burying several lengths of galvanized chicken-wire fencing a few inches underground, and then keeping the ground wet down quite well. (Note 1.)

Transmitting Apparatus

It has probably been the experience of a great many amateur radio operators that the consistent operation of the transmitting set is a matter in which a great many factors are involved. Blinking the neighbors' lights results in the power company getting "ruffled up", and buzzing the neighborhood phones rouses the ire of the telephone company. Often one's own family objects to being kept awake by the spark, to say nothing of the neighbors' views on this breach of etiquette. Those difficulties obviated, troubles develop elsewhere. Condensers shoot out or the rotary motor gets a kick-back and burns a field open, or maybe the key gets all "het" up and sticks, or the contact points get loose. These troubles can pretty nearly always be remedied or obviated entirely by the proper choice and layout of apparatus, and the use of protective equipment.

The Transformer

If a man builds a transformer because it seems cheaper than to buy one, he is quite likely to skimp on materials to make it still cheaper. Very few amateurs are competent to design and build transformers. Usually due to poor design they draw excessive current, and frequently they have poor or insufficient insulation between the primary and secondary windings, leading

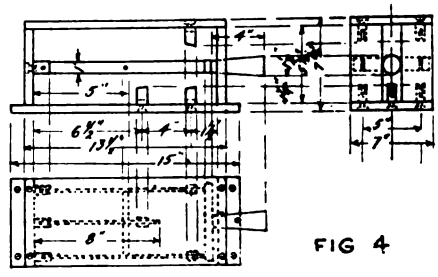


FIG 4

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eventually to leakage and breakdown. Home made transformers very often cause the power and telephone companies considerable trouble, and incidentally the owner also.

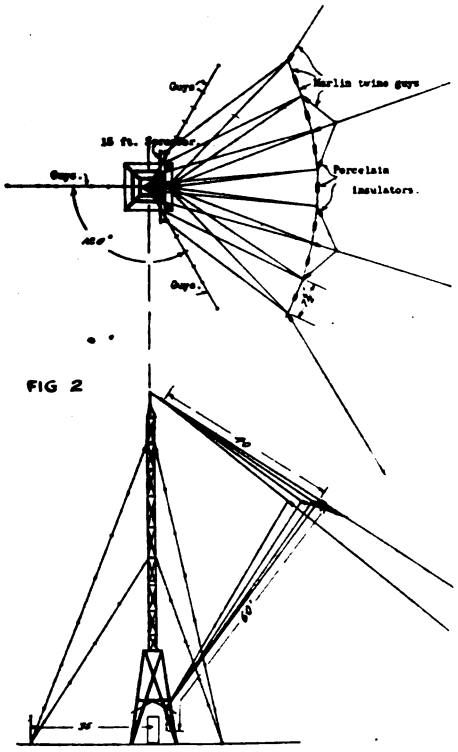


FIG 2

The better idea is to buy one of the reliable make of transformers on the market. It would be commendable of the manufacturers if they made these transformers with two-coil primaries, so that they could be used in multiple on 110 volts or in series on 220 volts. In the case of a 1KW installation, the power companies would very likely be more consentient to running in a third wire, and changing the meter for three wire 220/110 service, than to hang a separate transformer for a special 110 volt circuit, which would require a separate meter also. Naturally a given transformer working on 220 volts draws only half the current that it would on 110 volts; consequently the lights would be affected only slightly, and the duty on the sending key would not be nearly so severe.

A closed core transformer of the non-resonant type is undoubtedly the best, as this type of transformer will hold up their voltage under load, and consequently work very satisfactorily over quite a range of spark frequencies. The high voltages of 20000 and thereabout are not at all essential. They only inflict a punishment on the best condenser, to say nothing of what they do to a poor condenser. Such voltage further neccessitates exceptionally good insulation of the spark gap, and all conductors of the oscillatory circuits. They also result in abnormally high voltage on the aerial, causing it to brush and lose a great amount of energy. Secondary voltages of 5000 to 10000 have been found entirely satisfactory in the case of the non-resonant type of transformer. (Note 2.)

Protective Apparatus

In the leads from the transformer secondary to the condenser there should be reactance or choke coils, to prevent high frequency currents getting back into the transformer. Across the primary terminals of the transformer there should be conected two 1 MFD. telephone condensers in series, with the center or common connection grounded. In addition to this there should be spark gaps from each side of the circuit to ground. This protection is to bleed off to ground any high frequency current caused by induced potentials of high frequency in the transformer. Such protection has generally been found very effective.

The Condenser

This piece of apparatus is probably the most troublesome of all to contemplate. It is no doubt less understood by the average amateur than any other part of the apparatus. Dielectric strength of a material should not be confused with its insulating property. Many good insulating materials are poor dielectrics. The property of a material of being able to store an electro-static charge is probably by reason of its peculiar molecular make-up. The charge, no doubt, disarranges the molecules, which are held in a state of strain or tension, and the discharge is caused by the reaction, when they resume their original arrangement. A great many insulating materials simply do not have the proper physical make-up.

Of all dielectrics, glass and mica are the best. Good glass is easier to obtain than good mica, and is much cheaper. A condenser develops a certain amount of heat, the same as any power consuming device; therefore provision should be made for properly cooling it. For this reason, regardless of the dielectric material, the plates should not be stacked together in a solid pack, but rather separated appreciably to allow for the circulation of the cooling medium. This is not done in the moulded condenser, and is probably the reason why so many of those units fail.

The accompanying drawing (Fig. 3) gives data and dimensions of a very reliable glass plate condenser to work under oil. It is of sufficient capacity, about .01 MFD., for a 1 KW installation, and good

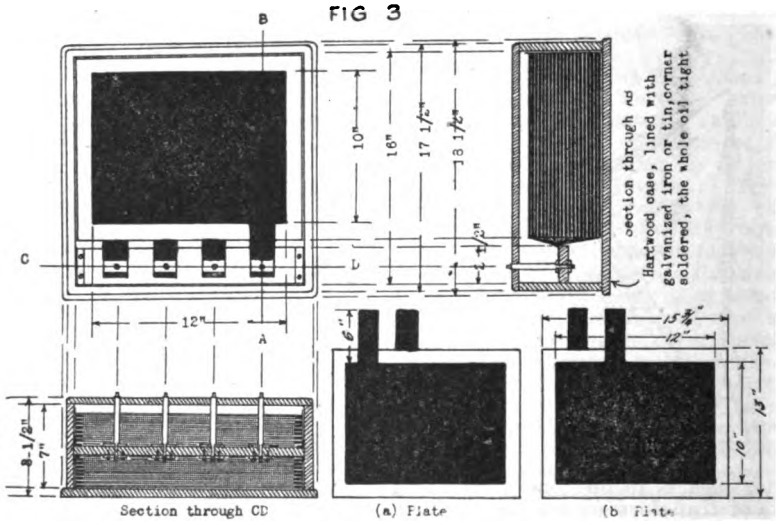
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for voltages up to 20,000 or more. First a galvanized iron or tin tank should be made, to fit snugly into a stout wooden box, of inside dimensions 16" x 16" x 7". Twenty one pieces of clear double strength window glass, which is about 1/32" thick, should be selected and cut to size, 13" x 15¾". Cut also 40 strips 1" x 13" to serve as separators. The plates should be thoroughly cleaned and dried. Forty pieces of tinfoil should then be cut to size, 10" x 12". Cut also forty strips 1¼" x 10", these to serve as leads to the terminals.

Give one plate at a time a coat of white shellac, and allow this to very nearly dry, when the strips should be placed as shown, one on each side, with the 6 inches projecting over the edge. Then immediately apply a sheet of tinfoil to each side, placing them centrally on the plate, and brushing all air bubbles out along the edge as applied. Now apply a coat of shellac all over, excepting on the leads, and place in a warm oven till the shellac is thoroughly dry. Twenty plates should be thus prepared, being exceedingly careful not to tear any of the leads.

Attention is called to the fact that the leads are not placed the same on all plates, for the reason that when assembled, the adjacent metallic surfaces must be of the same potential. The oil is used merely as an insulating and cooling agent, and not as a dielectric. Ten plates are made up with leads as shown in (a) and ten as in (b), in Fig. 3. Before assembling the condenser, a terminal block should be made of wood and fastened firmly in the position shown, by soldering metal angles to the side of the tank. To assemble the condenser, place the extra glass plate directly on the bottom of the tank, against the side opposite the terminal board. Then place two of the glass strips on this, along each end of the plate. Upon these strips place one of the (a) plates, bringing the leads up on top of the terminal block. Then place two more of the glass strips as before and add a (b) plate. Proceed thus alternating (a) and (b) plates, until ten plates are in position. The last plate will be a (b), with separating strips along the ends of it. Now reverse a (b) plate end for end and place it in position next to the other (b) plate. Now add an (a) plate reversed, and proceed thus, alternating (b) and (a) plates, reversed as mentioned, until the ten are in place. The terminals may now be screwed in place, clamping the leads together tightly against the block. The terminals may be of ¼" brass rod turned down on both ends and threaded 8/32, and insulated with a piece of rubber tubing slipped down over them. The metal plate under the terminal board should be threaded and fastened to the terminal board so that it will always be held in place properly, with no chance of working loose and falling into the tank.

FIG 3



The condenser should now be filled with oil, which should be done slowly, first tilting the terminal side up considerably to allow the air to issue out from between the plates as the oil rises, thus preventing any air being trapped between plates. The condenser should not be filled with oil until it is placed in its permanent resting place, as it is very heavy and awkward to handle after being filled. A cover should be provided, as well as binding posts for the terminals. It will be evident that on connecting the two adjacent terminals together and the others across the transformer, we are working the two sections in series, and

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that as all adjacent metallic surfaces are of the same potential at a given instant, there will be no tendency for sparking across through the oil. Such a condenser as this has been in service for a number of years, and used in that time on several transformers, with entire satisfaction, having a very great safety factor. (Note 3.)

(*Concluded next issue*)

Comment

Note 1. We must say, as we did regarding Mr. Mathews' article, that we cannot agree with the author that he describes an ideal ground, and again we would recommend a "Round's round ground" or, failing that, a symmetrical arrangement of buried radial wires or a radial counterpoise.

Note 2. We feel that the ideal transmitter should have the greatest possible range for 1 k.w. input, and of course the higher the voltage the more the power that can be stored in a given condenser. In our opinion, then, higher voltages than Mr. Denny recommends are desirable for average amateur operation.

Note 3. The ¼" brass rod terminals shown in the design do not impress us as ideal. We think there should be more surface. It will be appparent that the design will permit the use of 1¼" ribbon for terminals, instead of the small rod, and this former we certainly recommend.

—Editor.

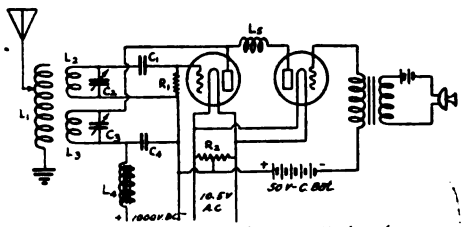
A Radiophone Employing A.C. and a Chemical Rectifier

By H. E. Bussey, 4AI

THE owner of the apparatus to be described had for several years experimented with spark radio transmission but, realizing the many advantages of tube transmission and being in possession of a few 50 watt tubes, decided to try out this phase of radio.

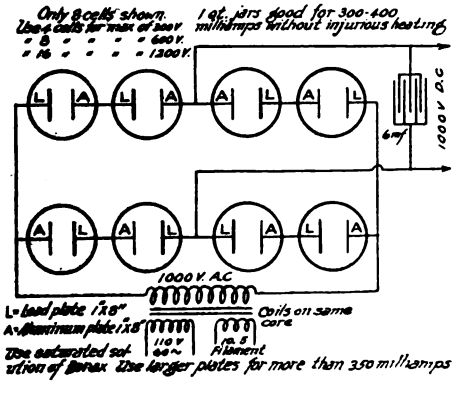
At the time experiments were started, little information of value could be obtained on circuits and circuit constants for best results, and a large amount of, what was to me, original work had to be done. This description is not offered as a model, or a theoretically correct solution of the problem, but sets forth the practical work done.

I had the tubes but no inductance or source of plate voltage. A generator was out of the question as a 1000 volt 100 watt generator was too expensive. I had a fair aerial and had done in excess of 1000 miles on 700 watts input with 60 cycle non-synchronous spark transmission. The aerial was poorly located and its capacity to surrounding objects too high and its dimensions not all that could be desired. It consisted of 4 wire flat top 63 feet long, about 35 feet high, its natural period being 162 meters. A counterpoise ground was used consisting of wire netting of an area about twice as great as the aerial flat-top. The counterpoise was used because the ground resistance in this section is unusually high, the city water pipes giving a resistance of 125 ohms at 110 volts 60 cycle A.C. by three-ground elimination method.



L_1 - 15 turns ¼/36 Litz on 2¾" O.D. tube, 5 single-turn taps
L_2-L_3 - 20 turns ¾/36 Litz on 2¾" O.D. tube, no taps
L_4 - 2 henry iron core choke
L_5 - 400 turn honey comb coil
C_1 - .002 M.F. cond. - C_2-C_3 - .001 variables C_4 - .002 cond.
All inductances in radio circuits closely coupled. Set L_1 for proper wave length then tune grid and plate circuit with C_2-C_3.

The first problem of plate supply was solved by the use of a 24-jar chemical rectifier. I foresaw plenty of trouble with this, but over a years' operation has not developed any. 110 volt 60 cycle power supply is used and, to smooth out, a condenser bank of 6 mfd. is used. The A.C.



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hum is very slight, and while it can be heard when not speaking into transmitter, it does not in the least interfere with speech.

The rectifier is made up of 24 quart jars. The electrodes are of lead and aluminum, each electrode 1" wide by 8" long, supported 1" apart. The electrolyte is a saturated solution of borax.

Filaments are lighted by A.C. from a winding on same core as used to step up 110 volts to 1000 for the rectifier.

Many circuits were tried and the choice narrowed down to the one indicated as being the best under my conditions.

With one 50 watt tube, the antenna current is 3.3 amperes, and CW telegraphy has been reported at 700 miles—readable 6 feet from phones—with 2 stages. Phone and buzzer-modulated have been heard QSA at 350 miles, but modulation is not as large a percentage as it will be later with an improved modulation scheme.

The accompanying sketches illustrate rectifier arrangement, also oscillation and modulation circuits, and with their legends will convey the necessary details of construction.

The Radio Work of the Dept. of Commerce

By J. H. Dellinger, Ph. D.

Chief of Radio Laboratory, Bureau of Standards.

All of us should be informed on the activities of those departments of our government charged with the development and administration of civilian radio. In this article, written especially for QST, Dr. Dellinger tells in interesting fashion of the work of the Inspection Service and the Bureau of Standards. The Editor particularly asks the attention of A.R.R.L. members to the extent to which these branches of our government are shown to be handicapped by lack of funds, and after reading this article you are requested to read the Editorial in this issue entitled "Friends of Ours." —Editor.

SINCE 1911, when regulation of radio communication was begun by the Department of Commerce, radio has undergone a wonderful development. The apparatus used has been changed, the methods have been greatly improved, and radio methods have become indispensable in marine and aerial navigation, in commerce, transportation, and the dissemination of information. The Atlantic has been spanned by the human voice, not only in a high power demonstration specially prepared by the joint efforts of the most powerful naval and commercial communication organizations of the world, but such a feat has also been reported in the ordinary working of the private amateur.

The technical progress and increasing scope of radio has required increasing activity in the Department of Commerce. Indeed the resources of the Department are at present inadequate to do justice to the work which it is called upon to perform. The two Bureaus principally concerned are the Bureau of Navigation and the Bureau of Standards. Because radio, in its beginning, was principally used to insure safety of vessels at sea, the administration of the radio laws was placed under the Bureau of Navigation, which supervises safety and other matters pertaining to ships.

The Bureau of Navigation inspects ship radio installations, issues station and operator licenses, and enforces the provisions of the radio laws, international conventions, and Department regulations. The Bureau of Standards is the technical branch of the Department in radio, and assists the Bureau of Navigation in its inspection and other work with technical information, instruments and methods for measurements, and conducts special investigations on problems that arise in the course of law enforcement.

Most of the radio and other work of the Bureau of Standards is directly for the public. A considerable part of the work of the radio laboratory is of interest to the amateur. Broadly, the work includes radio research, engineering, standardization of apparatus, a certain incidental amount of operating, and the preparation of technical information.

The radio laboratory is housed in a two-story laboratory building, adjacent to the electrical building of the Bureau. This building is devoted exclusively to radio work. The Bureau laboratory occupies the upper floor, the lower floor being the location of research laboratories of the Navy Department and the Signal Corps.

Standards are established and improvements made in the accuracy of standardization of frequency (wave length), capacity, inductance, and resistance, all at radio frequencies. The radio laboratory assists in the standardization of definitions for radio terms, symbols for radio instruments and apparatus, and endeavors to keep an up-to-date file of standard definitions, abbreviations, etc. A comprehensive reference list (now containing about 10,000 references) is maintained and kept up to date by the examination of current periodical and other radio literature. A detailed

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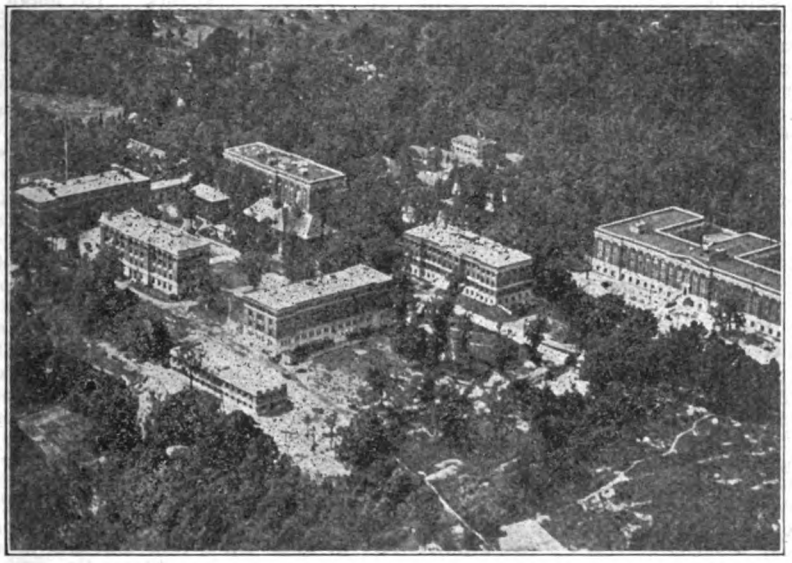
radio subject classification has been devised and is used in the filing of references and other information. In these ways and by reports, publications, etc., the laboratory serves as a clearing-house for radio information.

The Bureau's research work is largely on fundamental principles and methods of measurement in such fields as radio waves, antennas, electron tubes and amplifiers, high-frequency telephony, radio instruments, and properties of materials. The work on antennas includes studies of coil antennas, condenser antennas, and other types, to determine the basis of correct design of an antenna for any particular purpose. One object of such work is to secure enough data about antennas so that it will be possible to predetermine received current when transmitting current and distance are known. This is closely related with the research work on radio waves.

A good example of research on radio wave phenomena is the study of fading, made jointly by the American Radio Relay League and the Bureau. The nature of the subject studied made large-scale tests of this kind very much more valuable than any work which the Bureau could do unaided. The data secured are most valuable, and supplement satisfactorily theoretical studies made by the Bureau. The understanding of fading and also of strays and other radio transmission phenomena is materially advanced as a result of these tests.

The electron tube, which has revolutionized radio communication and greatly improved wire telephony, has been one of the principal objects of research in the Bureau radio laboratory. The work on this includes the measurement of properties of various types of tubes and the relation of these properties to performance as generators, detectors, and amplifiers of alternating currents. Special methods of measurement are developed for this work, and standard tubes prepared. Among the principal applications of electron tubes are radio telephony and high-frequency wire telephony. The various circuits and methods are studied, including novel methods.

The Bureau co-operates in radio research and does radio engineering work for a considerable number of other branches of the Government. Some of these projects have vital connection with the future possibilities and wide extension of the use of radio. A conspicuous example is co-operation with the Bureau of Lighthouses (also of the Department of Commerce) in establishing the radio fog signal system. The Bureau of Standards developed automatic transmitting sets for installation at lighthouses as well as a radio compass or direction finder outfit for use on ships in conjunction with the regular ship's compass. The two Bureaus jointly tried these under practical conditions, and the Bureau of Lighthouses now has radio beacons in operation at three light stations near New York City. Any vessel equipped with a radio direction finder can both navigate and determine its position in any fog by the aid of these radio signals. The system will be extended to other parts of



AIRPLANE VIEW OF THE BUREAU OF STANDARDS

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our coasts when the Bureau of Lighthouses secures funds for the purpose.

The work of the Bureau of Navigation is carried on mainly through the radio inspectors, there being one in each radio district with assistant inspectors in some districts. The offices of the inspectors are at Boston, New York, Baltimore, New Orleans, San Francisco, Seattle, Detroit, and Chicago. One of their first duties is the inspection of radio apparatus on ships. During the last fiscal year they made 5400 inspections of ship radio apparatus, resulting in the discovery of over 800 defects in apparatus. In many cases they assisted and instructed operators in the proper care and use of the radio equipment.

The inspectors' duties are by no means limited to ship inspections. They examine prospective operators and issue licenses. In the year preceding July 1, 1920, about 5000 commercial operators' licenses were issued, three times as many as during any previous year. This was not the total number of applicants examined; over 3000 applicants failed to pass the examinations, showing that a high standard of skill was maintained in the granting of licenses. During the same period over 6000 amateur first and second grade licenses were issued. This kind of work continues to increase; thus over 1000 amateur licenses were issued in February, 1921, and still more in March. The examination and licensing of stations also keeps pace with the increasing task of licensing operators.

The radio laws require the Department of Commerce to enforce all laws, regulations, and international conventions ratified by the U. S. relating to radio. Outside of the licensing and ship inspection work mentioned, the Department has been able to do relatively little with the small force at its disposal. There are many provisions of the laws, notably the requirements as to wave length and decrement, which the Department should be able to enforce more actively. To be sure, the Department has received excellent cooperation from the radio fraternity generally, but the radio inspection force should be adequate to assist people to comply with the law and cope with such offenders as do exist.

As far as the amateurs are concerned, particularly whole-hearted co-operation has been the rule. The amateurs seem to appreceiate that the Department has always had their interests in mind. They have even come forward with plans for policing themselves. Such a plan has had particular success in the Chicago area, and it may well be extended widely.

The necessary provisions to insure adequate administration of the radio laws include increases in the number and in the qualifications of inspectors and in the equipment at their disposal. In one district one inspector, single handed, has jurisdiction over one quarter of the United States; he has more than he can do to keep up with the routine of licensing and certainly can not undertake inspection of existing stations. Not only must more inspectors be provided but the Department must be able to hold good men when they are obtained. The low salary paid the inspectors is notorious among radio men and most of the experienced inspectors have naturally left the service.

The inspectors must have a certain amount of modern equipment if they are even to attempt to enforce the laws. Each inspector should have a well designed direction finder and receiving outfit to assist in locating offenders. To make the examination of operators more practical, and for other purposes, the inspector should have a radio transmitting set. For the inspection work now being done, it is imperative that the inspectors' measuring instruments be extended to cover the long wave lengths and very small decrements now used.

In the technical laboratory work done at the Bureau of Standards as well as in the field and inspection work done by the Bureau of Navigation, the Department needs increased support for its radio work. The work of the radio laboratory has been in part carried on by allotments of funds from other departments. Such allotments cannot be continued because of reductions in the other departments' appropriations and the result is that the money available for carrying on the Bureau of Standards' radio work this year is half of what it was two years ago, and the sum appropriated for the next fiscal year is only a third. This is especially regrettable at a time when the Bureau is receiving more calls for service along radio lines than ever before, and when the use and importance of radio generally is so rapidly advancing.

The increased appropriation necessary to perform the radio inspection and licensing work more adequately has been requested by the chief of the Bureau of Navigation in his annual report. Additional funds have also been asked for the Bureau of Standards. The general necessity of economy, however, by which Congress is confronted may result in refusal of these requests. Unless the appropriations are adequate it is obvious that the Department's radio work can not be performed properly.

The progress in radio communication has rendered many provisions of the radio laws and of the 1912 London Radiotelegraphic Convention unsuitable to modern radio practice. The Department of Commerce is working actively with a

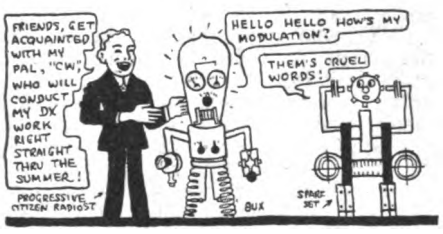
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view to changes in the fundamental laws and agreements, both national and international, to accord with the latest developments. The Department had a representative in Paris last year, attending a preliminary international conference, which prepared a protocol or report that is already influencing practice in the choice of wave lengths, in the classification of modern types of radio systems, etc. The Department subsequently appointed a committee representing American radio interests, which prepared valuable modifications of the protocol. Legislation is also being prepared which eliminates obsolete features in the present radio law and provides for keeping the radio adminstration up to date. In all of its work, the continued interest of the radio men of the country, including the amateurs, will be of the greatest assistance to the Department.

Coming---The Static-Puncturing Contest!

COME on, you fellows who have packed your sets away for the summer. Come on and get in line with the rest of the gang and take part in our big summer QRN puncturing contest. We are going to try to knock this old buzzard QRN into a cocked hat, and to do that successfully we need all the help we can get. We want every A.R.R.L. member and every other amateur who is interested in citizen wireless to get in on the fun. It will take quite a bit of hearty co-operation to put Old Man Static under the quilts, but by the Ever-Leaking Grid, we can and will do it! It makes no difference whether you operate a steen-step radio frequency amplifier or have a set consisting of a hunka coal with a safety pin for a holder and a bed spring for an aerial. Come on, everybody, and let's hit Old Man Static with a crash that will jar him loose from his nipperdrink.

The idea, in the main, is to settle once and for all the question whether or not C.W. will come thru when the spark falls down. You all remember the argument that makes every man wish he had never heard of spark gaps. Just you mention the high note vs. low note to some gap fanatic and then make your preparations for a hurried retreat if you don't care to hear what drove so many amateurs to sea, where the rotary spark gap is as free from mention as our straight C.W. is from decrement. The scheme, tentatively, is this: In each division of our organization we will have pairs of stations, consisting of the most powerful spark and C.W. transmitters in their respective classes, transmit a message for you to copy. At a specified time and on given wave lengths each station in turn will test for a few minutes so that you may tune your receivers to the respective waves of each transmitter. The preliminary test will take place on July 16th, and on July 19th the final messages will be broadcasted, a different message from each station transmitting. Now your part will be to copy every message from every station, if you can. At any rate copy as much from each station as possible, which will be to your advantage. While you are copying, you must have at least two witnesses to your reception and their signatures must be affixed to your copy of each message. You may select your witnesses from the following list: mother, father, sister, brother, uncle, aunt, grandmother, grandfather, a blacksmith, clergyman, policeman, doctor, or lawyer. After the entire transmission is completed, determine in air-line miles the distance of each transmitter from your station. Then add



all the distances of the spark stations and C.W. stations together, which will give you a grand total of air-line miles. The man having the greatest number of miles to his credit wins the contest. The winner will be asked to furnish a photograph of himself and a description of the receiving equipment with which he won the contest. Other men with big scores will be given honorable mention in QST. Mail your records to A.R.R.L. Headquarters, 1045 Main Street, Hartford, Conn.

We are going to have two nights of real fun and you should not miss it. Watch July QST for the whole story and how you can join the gang in this contest of good receivers. We will find out who is the best receiver thru Old Man QRN. This will be the first time that we have attempted anything like it right when Old Man Static is at his peak, and we are going to "get" that peak.

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Results of Washington's Birthday Relay

By W. H. Kirwan, Contest Manager

ON the night of Feb. 21st the biggest free-for-all relay was run thruout the United States and Canada. An actual count of the answers received showed that over 7240 amateurs sent in reports. The message was one from Mr. Harding, now President Harding. It consisted of 30 words and 14 of them came thru from the Atlantic Coast in great shape, 14 from the Pacific Coast in better shape, and the other two words were easily copied from the middle west.

Complete correct message: "May the spirit of Washington be our guide in all our national aspirations and may the current year mark the return of tranquility, stability, confidence and progress thruout entire world."

Fourteen of these words, representing the first, third, fifth, etc., were sent from the Atlantic Coast; fourteen representing the second, fourth sixth, etc., came from the Pacific Coast, and the remaining two from the Mississippi Valley. Some perfectly wonderful receiving was done and some real records made and as a whole it was a very creditable performance of the real amateur body. If this magazine were large enough it would publish names of all those who participated, but we don't believe that it would be interesting. As far as getting the message across the country was concerned, no trouble was experienced; but the fact remains that without, say, about six stations, the relay would have been a failure, particularly in the east where there was the most noticeable QRM, QRN, QSS. These stations are NSF, 8XK, 9ZN, 9LR, 5YH, and a few others. Nearly all the reports show that sigs. were hard to read and the boys waited until either one or the other of these stations sent in order to check up the msg. A slip-up occurred somewhere between 9LR and 8XK of one word only and even NSF, who could not do otherwise, sent the word as they received it. This caused a lot of stations to get one word incorrectly and naturally marked for the error, as there was no other way to do it.

Incidents of the Relay

Hertz of Washington State, who was to send the relay east, got into trouble at the last minute, but we had him covered by 7YS, St. Martin's College, Lacey, Wash., who sent in his stead. Bessey of Sunnyvale, Calif., who was to start the MSG. east from Calif., went fishing and forgot it, but was located thru our frantic efforts and put the southbound MSG. thru in great shape.

Personally I want to thank each and every one that helped in this relay for their most wonderful assistance and cooperation. I do not believe that there is in this world a body of men or boys that works closer together for the common cause, than our amateur radio workers.

H. P. Maxim's station in Hartford, Conn., started the west-bound MSG. and was considerably handicapped by local QRM but his sigs were clearly read in the middle west as the report shows.

No attempt was made by the writer to notify anybody to keep real quiet as the conditions were wanted real bad so that only the real hard workers would get the msg. and those without the real experience would have lots of trouble. This was just as it turned out, as some seem to think that all you have to do now is to stick a piece of wire in the air and tie a phone to it and listen in. This relay started some few thinking, you may be sure, and took some of the swelling out of others who can receive real well under good conditions. The reason that the relay results were not printed sooner, boys, is on account of the magazines wanting the story about two months before you get your magazine and after crawling thru about two tons of letters and sorting them, reading, checking, tabulating, marking, etc., I found that two months were gone.

Results of Relay

Fourteen governors of as many states received this message from the amateurs, several of them being called out of bed to sign for it. A certain Catholic priest got the Governor of his state out of bed to sign for the message, and this governor, who lives in the south, thought it was a MSG. from the Night Riders. Our friend the priest told him, "No, it's the Night Radioers".

Two hundred and forty seven mayors of as many cities were disturbed at all hours to sign for the MSG. and did so like real fellows.

One enterprising amateur had the nerve to give to the then president Wilson at Washington a copy of Mr. Harding's msg. Thought that this was carrying out orders in great shape. Twenty-two U. S. senators, 35 state senators, over 500 Chiefs of Police, Selectmen, City Councilmen, Sheriffs, Postmasters and News Editors, received the msg. This was a most wonderful showing and some of the reports sent in were really masterpieces. Some made errors in time of sending stations, call letters, etc., and

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will have a whole year to improve their receiving in order to get the next national msg. correctly. Some amateurs worked in pairs, but the results were only put in the name of the one to whom the receipt was given. Everyone in the U. S. engaged in the wireless business was solicited for prizes and willingly gave to the limit allowed, which was one prize only from each one. All the sending stations that helped in the relay have been sent a complete report of it by the writer and can tell easily who received their sigs and just how far they went under the bad conditions prevalent. The tabulated reports on the relay were submitted to the Prize Committee:—Dr. A. N. Goldsmith Institute of Radio Engineers; Mr. E. H. Armstrong, of Yonkers, New York, whom you all know; and Mr. Hiram Percy Maxim, President of the American Radio Relay League of Hartford, Conn. All three of them agreed on awarding the prizes on the basis of SPEEDY AND CORRECT RECEPTION, together with the marks for the perfect wireless report about the conditions. All of this figured down to miles per minute in receiving and delivering.

Very few of you will be able to comprehend the great amount of work in connection with this relay and I hope that the awards will meet with your approval and that you all will thank the many dealers who made the distribution of prizes possible. The first prize winners were consulted as to their pick of the prizes and the others awarded on the basis of their report marks and the relative value of the prizes. The prize winners are listed below without their addresses, which the writer has here, and to get your prize merely send a letter to W. H. Kirwan, Box 148, Davenport, Iowa, stating what prize you get and the writer will approve it and send it on to the donor of that prize. If anyone has any trouble getting their prize, merely drop another line and we will get you straightened out. All the possible advertising you can do with your prize please do, as it will show the real world who the co-operative dealer is that takes enough interest in the game to make the relays worth while. Do not judge the prizes by their value but from the fact that they are prizes.

As stated before the only lady in the United States who received the message correctly and made good time and turned in a good report was Miss Winnie Dow of Tacoma, Wash. I have not written to anyone yet about the prizes, as the magazine they read is the place to find out all about it. Lots of ladies sent in reports but a great many considered the report as a joke and their marks were likewise.

A certain man in the middle west sent in a report as a lady and used a lady's name, but a little wireless detecting soon found him out and we sent his report back to him to frame and show his children when he grew up, how he nearly won a prize—almost. The first prize is won by Leander L. Hoyt, of Haywood, Calif., whose report decided all the judges. Hoyt worked with Mr. S. D. Browning in his city and says that he also deserves credit. Mr. Hoyt also won in 1917 the Long Wave Chambers Coupler as fifth prize. Mr. Hoyt says nothing will satisfy his craving but the Clapp-Eastham ZRF Regenerative Receiver and when he complies with the request in the story we will see that he gets it and tells us all later how it works.

A Testimonial

R. E. BRIGHAM

Jeweler

Oneonta, New York
April 30th, 1921.

Mr. K. B. Warner, Sec.,
Hartford, Conn.,
Dear Mr. Warner:

Check received in payment of the A.R.R.L. Certificate of Indebtedness which I held.

I wish to commend the management of QST which has made it possible to pay off the Bonds. I would have been satisfied if the money had not ever been paid back as the QST has grown so much better that I was sure the money was being well spent.

Yours very truly,
(Signed) R. E. BRIGHAM.

Prize Winners

1—Leander L. Hoyt, & friend, Hayward, Calif., Clapp Eastman ZRF Reg. Receiver.

2—Miss Winnie Dow, Tacoma, Wash., the Navy Type Tuner donated by Sears-Roebuck Co.

3—M. S. Andelin, Richfield, Utah—gets the Chicago Radio Lab. Zenith Regenerator.

4—N. Hood, Casper, Wyoming—gets the Grebe CR3A regenerative receiver.

5—D. I. Bailey, Clinton, Iowa—gets the Electric Specialty Co. ESCO Receiver.

6—H. Berringer, Burlingame, Calif., gets the 2-step Amplifier from Montgomery-Ward Co. This will help him to get even better signals from the east.

7—J. R. Hall, Washington, Penn.—gets the one-step Amplifier donated by the General Radio Co., Cambridge, Mass.

8—E. Statts, Sacramento, Cal.—1 Illinois watch—donated by the Illinois Watch Co., of Springfield, Ill.

9—V. McIlwaine, Auburn, Ala.—1 NSR-300 or 600 Rotary Gap—donated by Wireless Mfg. Co., Canton, Ohio.

10—R. McCommon, East Palestine, Ohio—1 Storage Battery—donated by Klaus Radio Co., Eureka, Ill.

11—Xenia Radio Club, Xenia, Ohio—1 $50 Coupon for goods from catalog of the AMRAD, New York.

12—E. W. Wilson, Olympia, Wash.—1 Spider Web Inductance tuner—donated by E. Turney, Radio Hill, Holmes, N. Y.

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13—D. A. Wheelow, Pierre, S. Dak.—1 Pair Lattice Variometers—donated by A. Hallbauer, Chicago, Ill.
14—G. Robinson, Richmond Va.—1 Antenna Switch—donated by Atlantic Radio Co., Boston, Mass.
15—J. E. Cain, Nashville, Tenn.—1 20,000 Meter Tuner—donated by TRESCO, Davenport, Ia.
16—S. Ruth, Lacey, Wash.—1 pair 50,000 ohm phones—donated by C. Brandes, Inc., New York.
17—Lowell Radio Club, Lowell, Mass—1 CW 20B. Enclosed Gap—donated by Karlowa Radio Corporation, Rock Island, Ill.
18—J. Bickel, Whittier, Cal.—1 No. 14A Rotary Gap—donated by The Wilcox Laboratories, Lansing, Mich.
19—W. Arnold, Southbridge, Mass.—1 Pair Phones—donated by John Firth, Inc., New York.
20—W. Shoop, Vandergrift, Penna.—1 Pair of Brownlie Phones—donated by John Firth & Co., New York.
21—R. Parker, Augusta, Maine—1 Pair No. 55 Phones—donated by W. J. Murdock Co., Chelsea, Mass.
22—E. Thatcher, Oberlin, Ohio—1 Acme 200 Watt. C.W. Transformer—donated by Acme Apparatus Co., Cambridge, Mass.
23—J. Coleman, Pittsburgh, Pa.—1 New Type Microphone for Radiofone—donated by Federal Tel. & Tel. Co., Buffalo, N. Y.
24—R. Willison, Portland, Ore.—1 No. 3 condenser with dial—donated by Chelsea Radio Co., Chelsea, Mass.
25—S. Ayer, Waterville, Maine—1 Radisco Coupler—donated by Radio Distributing Co., Newark, N. J.
26—B. Benning, Atlanta, Ga.—One quarter KVA Transformer—donated by Thordarson Elec. Mfg. Co., Chicago, Ill.
27—A. Kisner, Fairmount, West, Va.—1 Oscillation Transformer with clips—donated by Shotton Radio Mfg. Co., Scranton, Pa.
28—A. Selby, Boise, Idaho—1 R37 Tuner Set—donated by Signal Elec. Mfg. Co., Menominee, Mich.
29—G. Barnes, Stanbridge East, Quebec, Canada—1 No. 181 Inductance—donated by the C. D. Tuska Co., Hartford, Conn.
30—Major H. Stethen, St. John's, Canada—1 Pair of Brownlie Phones.
31—Rev. Father Burns, Marshall, Texas—1 Pair of Brownlie Phones.
32—B. Phelps, Minneapolis, Minn.—1 O-5 Eldredge H.W. Meter—donated by J. Firth & Co.
33—J. Gjelhaug, Baudette, Minn.—1 O-5 Eldredge H.W. Meter—donated by J. Firth & Co.
34—F. Mahr, San Francisco, Calif.—1 O-1 Eldredge H.W. Meter—donated by J. Firth & Co.
35—J. Martin, Amarillo, Texas—1 O-1 Eldredge H.W. Meter—donated by J. Firth & Co.
36—Benzeeros., Buffalo, N. Y.—1 O-3 Midget Advance Meter—donated by J. Firth & Co. N. Y.
37—J. Dewitt, Nashville, Tenn.—1 Pair Brownlie Phones—donated by J. Firth & Co.
38—A. Lorimer, Montreal, Can.—1 Set honey-comb coils—donated by Coto-Coil Co., Providence, R. I.
39—C. Jones, Northfield, Vt.—1 No. 21 Variable grid Leak—donated by Chelsea Radio Co., Chelsea, Mass.
40—F. Fallain, Flint, Mich.—1 No. 182 Inductance—donated by C. D. Tuska Co.
41—E. Brack, Midville, Ga.—1 No. 41 Bakelite dial—donated by Chelsea Radio Co., Chelsea, Mass.

Two following get one Connecticut Variable Condenser—donated by Conn. Tel. and Elec. Co., Meriden, Conn.:

42—O. Bowers, Marietta, Ohio.
43—J. Miller, Hammond, Ind.

Each of following get a UV-200 bulb donated by the Radio Corp. of America. These bulbs may be had by writing direct to QST, Hartford, Conn., and explaining your wish:

44—M. Powell, Warren, Arizona.
45—D. Culbert, Warren, Arizona.
46—L. Runey, Belmont, Mass.
47—R. Taggart, Pasadena, Calif.
48—F. Weyerhauser, Pasadena, Calif.
49—K. Lloyd, Erie, Penna.

Each of following gets a UV-201 bulb donated By Radio Corp. of America by writing to QST., Hartford, Conn.:

50—T. Banks, Williamstown, Mass.
51—H. Brewer, Emeryville, Calif.
52—A. E. Bessey, Sunnyvale, Calif.
53—T. House, Dublin, Texas.
54—M. Apple, McKinney, Texas.
55—R. Stott, Douglas, Arizona.

Following get a bulb from the Audiotron Mfg. Co., through E. T. Cunningham, San Francisco:

56—L. Peine, Houston, Texas, 1 C-301. The writer has these bulbs at Davenport, Ia.
57—G. Riddell, Sheboygan, Wisc.

The following get a yearly subscription to the "Pacific Radio News" of Frisco.:

58—C. Lundquist, Winfield, Iowa.
59—H. Dunn, Oxford, Ohio.
60—R. Brigham, Oneonta, N. Y.
61—J. Kolb, Louisville, Ky.
62—H. Sairs, Ambridge, Penna.
63—J. Copeland, Ashland, Ohio.
64—R. Winchester, Syracuse, N. Y.
65—P. Harmegnies, Rapid City, S. D.
66—L. Mathias, Antigo, Wis.
67—W. C. Bridges, Superior, Wis.

The following get a one years' subscription to "Radio News", of New York:

68—F. Breene, Iowa City, Iowa.
69—E. Beardmon, Glasco, Kansas.
70—J. Imsdahl, Pitt, Minn.
71—D. L. Caston, Gainesville, Ga.
72—M. Koupal, Eugene, Oregon.

The following get a one years' subscription to "QST," of Hartford, Conn.:

73—A. Welch, Gardiner, Maine.
74—G. Turner, Independence, Mo.
75—M. Flynt, Madison, Maine.
76—F. Miller, Emporia, Kas.
77—W. Harris, Marshfield, Oregon.
78—E. Anderson, Marshfield, Ore.—2-year subscription to "Radio Topics" of Chicago.

Notes on Relay

Everybody interested in this relay claimed that it was real sport, instructive and very interesting, and gave the boys a chance to do some real long distance work at least once a year. It also brings to the attention of the public the wonderful strides made in citizen radio, thereby helping the game.

For a prize to repay the writer for all the hard work and money spent on this relay the Prize Committee were unanimous in stating that the prize would be given in RADIO HEAVEN, wherever that may be. Hope the static is not bad, at least.

Hundreds of amateurs thruout the U. S. and Canada have requested that Washington's Birthday be set aside as a National Relay for the amateurs and that all the amateurs would stand by for one big relay once each year. Have been appointed chief of these relays by at least 500 who probably mean well but don't know that the writer is getting old and each relay has added another handful of grey hair on the back and removed the same amount from the front of my head. Let's have some opinions, anyway, about this National Relay so that irrespective of color, creed, or previous servitude, all may join in once a year at least in a free-for-all contest.

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Amateurs Wanted to Join Signal Reserve Corps

IT will be of interest to amateur radio operators throughout the United States to know that the War Department, thru the Chief Signal Officer of the Army, is now making arrangements for the training of amateur radio operators and devising plans for their service should the Nation need them in an emergency.

The proposed plans provide for the recognition of organizations of amateurs within each Army Corps Area. The headquarters of these various Army Corps Areas are as follows:

Headquarters 1st Corps Area—
99 Chauncey St., Boston, Massachusetts

Headquarters 2nd Corps Area—
39 Whitehall St., New York City

Headquarters 3rd Corps Area—
Fort Howard, Md. (Near Baltimore)

Headquarters 4th Corps Area—
Fort McPherson, Ga. (Near Atlanta)

Headquarters 5th Corps Area—
Fort Benjamin Harrison, Indiana
(Near Indianapolis)

Headquarters 6th Corps Area—
Fort Sheridan, Ill. (Near Chicago)

Headquarters 7th Corps Area—
Fort Crook, Nebr. (Near Omaha)

Headquarters 8th Corps Area—
Fort Sam Houston, San Antonio, Texas

Headquarters 9th Corps Area—
Presidio, San Francisco, California

At each of the headquarters there is to be established a transmitting radio station with a range sufficiently great to cover the entire Corps Area, and also a receiving set.

Courses of instruction will be prepared and sent out by radio and by mail. Questions will be received and answered.

The amateur radio personnel will be formally inducted into the Signal Reserve Corps and called to active service where practicable for approximately two weeks' camp during the summer.

We believe this plan will produce results of far-reaching importance. Interested amateurs are requested to communicate at once with their proper Corps Area headquarters.

A Suggestion

THE following communication has been received at A.R.R.L. Headquarters and is published for comment:

Say Son, may I make a suggestion? I've been chewing it over for some months. Some of us would like to listen to the Sixth and Seventh Districts once in a while. Maybe we can get across to them in one hop some night. It cannot be done now on account of the DX QRM. Most of the latter comes pouring out of the Second and Third Districts. What ails those ginks over East anyway? The way they roar and beller is something scandalous. Have they found a way to push more energy into a watt or what is it? But anyway, what I want to suggest is that we have some quiet hours. What's the harm of having some quiet once in a while? It wouldn't hurt anybody. If we who live in the eastern half of the country would all QRX for an hour or so twice a week and if those who live in the western half would do the same a couple of other nights there would be some new and interesting records established. Your Uncle thinks it would not be long before some of the wise ones would arrange schedules and you would soon see traffic going across from coast to coast in one hop.

What's the matter with making it Tuesday and Thursday nights in the eastern half of the country, say between eleven and one Central Time? And then make it Wednesday and Friday nights in the western half between eight and ten Pacific Time. Every Hooligan who broke the rule and did any transmitting during the quiet hours, to be taken out at sunrise and boiled in transformer oil until he is rendered pliable.

The Old Man.

What does the Gang say, fellows? Shall we have them or not? Is it worth the effort? Is the majority willing to stand by for the general good so that some records may be established? We want to hear from A.R.R.L. members on this, and if the decision is in favor of having listening hours our Operating Department will dope out a plan and launch it this summer so that it will be in full operation and a recognized thing by fall weather.

We Are Paying Our Bonds

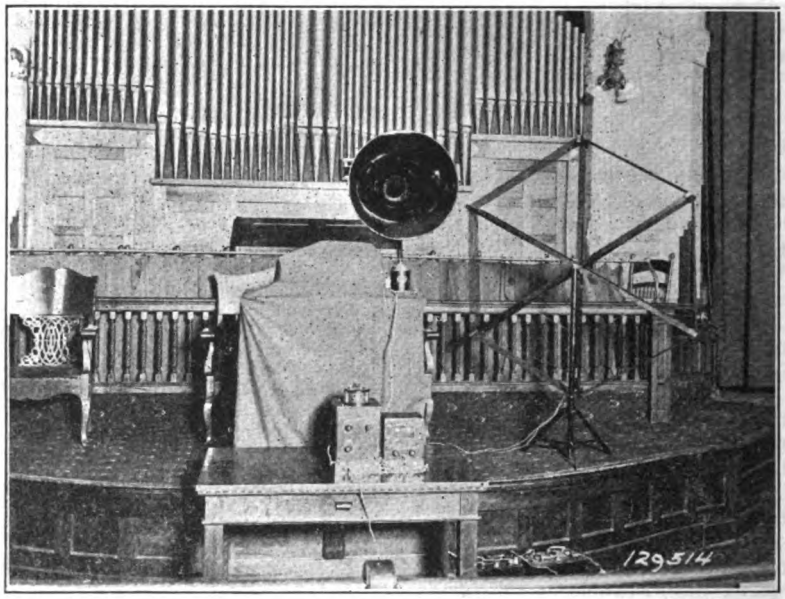
THE A.R.R.L. Certificates of Indebtedness were called for payment as of May 1st. Not all of them have been turned in. Notice is hereby given to all parties holding such bonds to return them at once for payment. If not turned in within ninety days from their maturity the A.R.R.L. cannot accept responsibility for their payment, nor can payment be made in any case unless the original certificate is surrendered.

K. B. WARNER, *Secretary.*

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The Invisible Minister

FOR the first time, as far as known, wireless telephony has been used to transmit services from one church to another in order that a congregation without a regular pastor could have the benefits of Sunday evening worship. The churches involved are the Calvary Episcopal and the Herron Avenue Presbyterian, both of Pittsburgh, Pennsylvania.



During a period of months the Sunday evening services of the Calvary Episcopal Church have been broadcasted from KDKA in East Pittsburgh, Pennsylvania. These services have been eagerly awaited by radio amateurs all over the United States.

The Herron Avenue congregation has been without the services of a regular pastor for some time, being forced by circumstances to use any substitute available. One or two of the congregation being wireless enthusiasts got in touch with the Westinghouse Company, requesting it to install a small receiving outfit in the church in order that the members could hear the Calvary services. This was done and a compact set consisting of a loop antenna, amplifier and condenser was placed upon the rostrum in front of the pulpit, as shown in our photograph. The loud-speaking horn rested directly on the pulpit.

An expectant throng filled the church and were not disappointed for the voices and music of the Calvary choir, rector and organ were received clearly and distinctly. In spite of the difference between Episcopal and Presbyterian services, the latter congregation followed the pastor in the former throughout. Even during the offertory hymn, contributions were accepted. During the sermon of the Calvary rector, intense interest was maintained at the Herron Avenue church so clearly and distinctly was the message received.

It is hard to say just what demonstrations like this will lead to, but certainly it proves the great flexibility of wireless telephony. There may be in the future a central pastor who will talk to thousands of congregations situated in all parts of the world, but this may take time. The idea is not far-fetched by any means, as the transmitting of the Calvary services proves.

Tubes Without Filaments

WONDERS never cease—in radio! A new and startling idea has been developed by two prominent radio engineers, Mr. C. G. Smith and Dr. V. Bush, of the Amrad research staff at Medford Hillside, Mass., in the shape of a new type of audion that will rectify, oscillate, amplify, and otherwise perform the work of modern three-electrode vacuum tubes, all without a filament. The tube was displayed and explained at a recent meeting of the Boston Section of the I. R. E. and we presume the paper delivered there will soon be available to the radio public in the Institute's Proceedings. As yet QST has only bare details of the "S-tube", as it is called, but we are asked to imagine a couple of metallic salt-shakers as used in any household, separated by a distance equal

(*Concluded on page 52*)

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EDITORIALS
de AMERICAN RADIO RELAY LEAGUE



Friends of Ours

IF we are good Americans and love our radio we ought to rise up on our hind legs and do something about the Department of Commerce appropriations. It is something we have worried about for a long time. When we read Dr. Dellinger's fine article in this issue and realize that the Bureau of Standards and the Bureau of Navigation are among the most important bureaus of our Government, it rouses us to action. It is a shame that they should be limited so pitiably as to money that they are unable to properly carry out the duties imposed upon them by law. They are both good friends of ours and what hurts them hurts us. The conditions in the Radio Inspection service are notorious and have been so for a long time. With the money that has been doled out it has been absolutely impossible to carry out the inspection work either of ships or amateurs. This ought not to be and it spells trouble later on. The service will lose its splendid *esprit de corps*, and the first thing we know it will degenerate into something which will not be pleasant to have around. It seems hard to understand why Congress will go on wasting money on some branches of the Government and allow such fine things as the Radio Inspection Service and the Bureau of Standards to go hang. In one breath we hear about the grand things the Government is going to do and in the next we see the most vital bureaus cut down in their money allotments until there is not enough to pay for stenographers to write necessary letters let alone perform the duties specified in the law.

It is a public disgrace in the case of the Bureau of Standards. Here is the one truly efficient and disinterested place in America where a citizen can go for technical assistance. It is the one place also where business concerns may go for disinterested help in technical matters. And the appropriations have been so cut that they can no longer keep their organizations together. The word has gone forth to prune expenditures and instead of applying the knife to places using thirty and forty percent of the public funds the knife is taken to the Department of Commerce which uses only a very few percent. If the whole blooming Department were thrown overboard it would not save an appreciable amount. The Government spends on silly partisan investigation as much as would run ten Inspection Services and Bureaus of Standards. It spends on printing and distributing hog-wash which no one even pretends to read all that would be needed to enable the Inspection Service and the Bureau of Standards to properly function to the benefit of millions of citizens. It spends upon tours of inspection of certain committees all the money needed to maintain ten times the *esprit de corps* of the Inspection Service and to maintain several of the organizations at the Bureau of Standards. It may be argued that we are a great nation and we can afford to enjoy ourselves with petty partisan investigations, and the printing and distribution of congressional hot air and the sending of committees on tours of inspection. Maybe we can, but it seems to us that if we afford these things then by the gods we can also afford to have a Radio Inspection Service and a Bureau of Standards. Our Board of Direction will be asked to take this matter up at its next meeting if we live.

The Aurora

IN middle May this little old globe of ours was the victim of a magnetic storm which for many hours and in some cases days completely tied up wire and cable communication and put a great big crimp in radio operation.

We hereby call upon A.R.R.L. members who made any careful observations during the disturbance to send in copies of their logs to Headquarters, as we would like to find out something about how this business affects our amateur radio. A lot of information has already come out. It seems there was another solar disturbance, a huge sun spot, which caused a violent magnetic storm on our earth and ionized our upper atmosphere with the resulting display of Northern Lights. The magnetic storm resulted in the establishment of earth currents which greatly disturbed the values of voltages being used on telegraph lines, in some cases the values of these potential differences between two points in the earth's crust being sufficient to reverse the current thru the lines. Con-

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stantly shifting in value, it was impossible to correct the voltages on the lines to overcome the disturbances of the earth currents.

A totally different action of the sun spot seems to have been the cause of our radio troubles, for it is doubtful if the earth currents have much effect on our operation. The thing that has bothered us is the ionization of our upper atmosphere, resulting in the high absorption of our radiated energy, so that signals do not get thru. It has been very interesting to note that signals from stations within the daylight range were not affected in any way. This is a strong confirmation of the theory now rapidly spreading that radio transmission has to be considered in two classes: direct propagation over the surface of the earth, the limit of which transmission marks the reliable non-fading (and incidentally, daylight) range of the station; and transmission which depends upon the traveling of the radiated energy along the so-called Heaviside layer, a medium normally of very low absorption but subject to disturbance which may be either local, resulting in fading or poor reception in one or more directions, or general, as in the case of ionization evidenced by aurora display, where the absorption is so great as to prevent the signals getting thru. As a side point it is to be noted that in this theory there probably would be an intermediate zone just outside the daylight radius of a given station where conditions would not permit the reflection of signals, accounting for the difficulty of maintaining communication over distances that are too great to work in daytime but which should be ridiculously easy at night— a phenomenon with which every amateur is familiar. Incidentally, all the increase in range that we amateurs experience at night over our daylight range is due to the easy passage of our signals over or thru some medium of much less absorption than the earth's crust, and unfortunately it seems such transmission will always be subject to irregularities. We should bear in mind that absolutely dependable communication at night cannot be expected over distances materially exceeding the daylight range.

Getting back to the aurora, what did you observe and what effect did it have on signals? Did any real DX come thru? Did you hear any weird noises? Let's find out something about Miss Aurora.

The Legislative Situation

IT never rains but it pours. There are seven bills relating to radio in the present Congress! Two of these are minor and have no bearing on us amateurs. Another is Senator Poindexter's infamous S. 31, on which it is expected further hearings will be held. This is the autocratic bill that was before the previous Congress under the number S.4038, and which would result in giving the Navy control over radio. To offset this bill Congressman White of Maine has introduced a bill, H.R.4132, now before the House Committee on Merchant Marine & Fisheries, which instead of forming a radio commission would empower the Secretary of Commerce to regulate radio, with an advisory committee to examine problems and report for his guidance. Another bill, H.R.5889, identical in important points but improved in many details, has since been introduced by Mr. White and referred to the same House committtee; and both bills have been introduced in the Senate by Senator Kellogg, given numbers S.1627 and S.1628 respectively, and referred to the Committee on Interstate Commerce. It is our understanding that the second bill has the active approval of the Department of Commerce.

Our Legislative Committee and our secretary spent several days of this month in Washington investigating conditions. Mr. White is a friend of the amateur, and as chairman of the Merchant Marine's sub-committee on radio he has invited our A.R.R.L. to present its views on his bills and promised us every consideration. Hearings on his bills will be held soon. They are not half bad, but we do not feel that we can actively support either of them. They provide that the Secretary of Commerce shall classify stations and assign wave lengths, decrements, power, working hours, etc., for each class. No regulations are contained in the bills, as in our present law, the idea being rather to create a framework that will provide for the administration of radio regulations and let the actual regulations be subject to change as the art progresses so that it will not be necessary to frame new laws in years to come. With this principle we agree in the main, but because we amateurs are in such a peculiar condition we think that the law ought definitely to specify our domain. We think we can consistently ask this because our wave length band is at one end of the radio scale and if definitely specified in the law it would stabilize the use of wave lengths immediately adjacent to ours; furthermore, we amateurs are not like the vast commercial companies who have the means to constantly guard their interests: we do not believe our future would be safe unless it was written into the law so that no amount of political pressure, change in officials, etc., could result in the unceremonious change in our wave length or other drastic action which would make junk out of our millions of dollars' worth of equipment.

Therefore we are going to ask that any new legislation shall specifically state that

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one of the classes of stations shall be citizen or amateur stations, and just what our wave length, decrement and power shall be. Every radio interest in the country admits the value of the amateur, and most of them are friendly towards us. We are sure they will see the reasonableness of our request that our future be written into the new law.

Our National Convention

HERE is news: from August 30th to September 3d, inclusive, the A.R.R.L. will hold its First National Convention at Chicago. There will be five Big Days as chock full of amateur radio as anyone can think of. Other amateur meetings have been heralded as the biggest thing that ever happened in amateur doings, and all of them were fine, but here is one that will outstrip them all, because it will be the first national convention of radio men ever held in this home of the ether-hound. We are telling you right now that you want by all means to get there, and come prepared to see the thing thru, for real amateur radio history is going to be made and you must be in on it. Never before has so pretentious an affair been attempted and if you miss it it will be the outstanding regret of your radio life. So take a tip from us, save up your money —make your vacation be at the Chicago convention!

Details of the program have not been completed but it is hard to imagine a schedule more enthralling to an amateur than is now in preparation. There will be business meetings at which we will discuss our co-operative problems of interference control, time division, traffic regulation, legislation, etc.; technical meetings to hear nationally-known authorities speak on spark and C.W. apparatus, both transmitting and receiving; educational lectures bearing on the fundamentals of electricity and radio; meetings to discuss club organization and activity; a meeting of the entire huge personnel of the A.R.R.L. Operating Department; a meeting of our Board of Direction; and the president of these United States and the secretaries of the departments of Commerce and Navy are to be invited to address us on our opening night. Not all of the convention will be brain food, tho, for automobile and motor bus tours, yacht and motor boat and hydro-aeroplane trips, swimming, tennis and golf, will all be available; a Liar's Contest will be held, with a big prize for the owl that can tell the worst yarn; a get-together absolutely without speeches or business will be held at one of Chicago's best cabarets; stunt parties; an indoor baseball game between the A.R.R.L. Board of Direction and the Chicago Executive Council; a whopping big banquet and dance on the famous beach walk of the beautiful Edgewater Beach Hotel on the last night; and thruout the convention a radio exhibit, open to the general public, that it is expected will surpass anything ever held. Arrangements are being made for the accommodation of the ladies, these plans including shoping tours thru the various stores, automobile and lake trips, etc. Everyone knows that Chicago is a most delightful place at that time of the year, and a radio man's vacation could not be spent with so much fun and keen interest as he will get at the coming meeting.

So start planning and saving, O.M., for we're looking for about five thousand like you to show up, and we can assure you that it's going to be so good that you simply can't afford to miss it.

Summer Arrives

IT has been the custom for some time for warm weather to come upon us about this time of the year. Personally we can't see why the air doesn't stay crisp and clear and shy of strays all the year around, but somehow things just started going this way and now it seems too late to correct them. We're confidently expecting, therefore, that it's going to get hot and that the air is going to have quite a lot of static in it before long.

But let's not let a little thing like that bother our radio work. The A.R.R.L. proved conclusively last summer that there isn't any such word as "season" in the bright lexicon of the amateur, or the lexicon of the bright amateur, whichever it is. Static gets rotten at times, it's true, and the long DX of winter isn't always possible, but it isn't half bad. Every so often in the worst summer weather there are nights as clear as winter and DX is fine. The fellows that locked up their sets last summer won't do it again for they have been told what they missed—how things rocked along just as merrily as of old. Don't *you* make that mistake.

It's time to revive the Home-to-Lunch Club. All you have to do to be an H.T.L. is to sit in when you are home at noon and get in on the fun. There will be lots of fellows within your range and you will find QRN practically nil during daylight. Daylight work is a thing that needs our serious consideration right now, fellows. Our Operating Department is looking for stations to form daylight routes, because traffic is surely going thru this summer.

Do you ever get up early? Of course not, when you operate all night, but on these hot nights when static is bothersome, try getting up about daylight in the freshness of the early morn, and notice how Old Man QRN seems to belong only with the night

(*Continued on page 50*)

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The Operating Department



F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.

WOULDN'T it be wonderful if Old Man Static (QRN) had lost his combination and could not tune his set to resonance this summer! Regardless of how we hate to have him and his twin brother QRM breaking up our lines of communication, he will be here just the same. Wonder if he will devise a new means of breaking up our CW operation? QRN has started his ruthlessness already and is almost back to summer normalcy. Can you imagine



QRM, who has been chopping away all winter, being greeted by his twin brother QRN who comes from under cover and looks fit as a fiddle, telling QRM to take care of the Northern stations while he (QRN) handles the Southern stations? Old Man QRN goes to work with such renewed effort that it seems as tho he did not need the assistance of QRM.

However, we have gone "over the top" with our traffic for the past month, our records showing a total of 10352 messages having been handled. 1921 is rewarding the fighters. Let us keep up the good work all thru the summer months.

For the second time in succession "Amateur Number One" leads the gang in messages handled and upholds the reputation of the New England Division, altho 2RK gave him a hot race, showing a total of 450 for the month.

MR. I. VERMILYA, 1HAA
Marion, Mass.
457 Messages
New England Division

Thru to Florida ! ! ! !

The Division Manager and the Operating Department personnel of the East Gulf Division are to be congratulated for the successful opening of a route to Florida over which traffic has moved during the month. The splendid spirit of co-operation combined with determination has made this possible under adverse atmospheric conditions.

Traffic has increased in the Roanoke Division thru the QRN, while the Delta Division stations are unable even to hear stations that can be communicated with under fair conditions.

Our Northern Route thru the Rocky Mountain Division is maintaining its right of way with all traffic and will continue to do so until the above mentioned "crepe hanger" (QRN) gets his set in resonance.

Your attention is invited to the report of the Atlantic Division. Every possible bit of information is contained therein and it ill becomes anyone to offer alibis for failure to move traffic into this division. A midwinter report in midsummer. F. B. Reports are missing from the following divisions: Central, Pacific, and St. Lawrence. Reports of the Division Managers follow:

CENTRAL DIVISION
R. H. G. Mathews, Mgr.

No detailed report received.

Total messages 2102. Busiest station, 8ZL—183 messages.

NEW ENGLAND DIVISION
G. R. Entwistle, Mgr.

C-W stations of all kinds are increasing in New England. Most of us are preparing to keep in this summer with C-W. It seems to be the only solution, or, at least, a partial solution to the QRN problem.

Let's award a prize to 1HAA's synchronous gap. It went a year without stopping (long) and it takes a pretty good piece of apparatus to do that. But at last it has succumbed. Its starting windings and one bearing went on strike a few days ago and now VN uses a straight gap. In spite of the disaster to the rotary, 1HAA handled 457 messages during the past month.

A.D.M. Robinson, (1CK), reports counterpoises all the rage, but that they only seem to work well in the hands of experienced CQers. 1CK handled a total of 167 messages during the past month.

1EAV hopes to shake the jinx and be

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with us again soon. He has a new thirty wire aerial of his own design with a 60 foot spread. Maine is heard from occasionally, 1FV and 1KAY being the ones best heard. D.S. Johnson, (1DY), reports that his detectives found that the strange QRN in Lynn was the street-car company's electric rail welder and it has stopped now. Johnson also says that he is having good success getting traffic thru to 1HAA and New York before midnight lately. The CQers in Lynn must be decreasing. 1DY handled a total of 238 messages during the past month.

A.D.M. Mix, (1TS), reports noticeable decrease in activity probably due to increasing QRN and also the Bureau of Standards' fading tests. Also that work is progressing fine on the C-W. 1TS has a 100 watt set now and is working 1RD in Brookline every night. Traffic is also handled with 1XX in Providence. The following C-W stations are now in actual operation in this section and covering good distances: 1NAQ, 1MO, 1FQ, 1GAI and 1TS. 1BM handled 20 messages, 1HO 86, and 1TS 94.

A.D.M. Castner, (1UQ), reports the advancement of this section as most encouraging. A reliable route to Bangor is in operation from Portland: 1UQ, 1FV, 1KAY, to 1CAO, 1UL, 1PAT to 1MBS to 1LAX, 1DAQ to 1OT, 1GQ. The route from Portland to Bar Harbor is: 1UQ, 1FV, 1KAY to 1CAO, 1UL, 1PAT to 1MBS to 1LAX, 1DAQ to 1MBZ. Portland has succeeded in connecting with southern QSR via 1DAC. 1MBZ and 1VT are making tests in an effort to hook up Bar Harbor with Calais. Many of the stations in Maine are planning to renew activity after school closes. 1FB will be right on the job after July 1st and will be able to clear all traffic for Maine. Stations in Portland broadcast every night at 7:15 p.m. Any stations hearing same, please send card to A.D.M. Castner at 15 Temple St., Portland, Maine.

Total msgs. 1062. Busiest station 1HAA, 457 msgs.

ATLANTIC DIVISION
C. H. Stewart, Mgr.

The Division Manager has at last realized his ambition to present a fairly complete report from all sections, and one which he believes shows steady progress is being made in the right direction.

Mr. Clifford J. Goette (2JU), A.D.M. Northern Section, reports that there have been quite extensive changes made in his section, resulting in the creation of one new district to be known as the Capitol District with headquarters at Albany. New York State outside of New York City and Long Island is now split into three districts, and the territory distributed in such a manner that each Superintendent is closely in touch with stations handling volume of traffic in each district. Each Superintendent has given the A.D.M. assurance that everything will be done to place the Northern Section on top where it rightfully belongs.

Numerous complaints have been received in reference to traffic between New York and Philadelphia not coming through in view of the fact that a day light route between these two cities exists. All stations in New York City, including Brooklyn, should clear through any of the following stations: 2FD, 2RB, 2ZD, 2RK and 2JU who will relay to 2ZL, 2EL, 2AJW, 2BGR, 2RL or 2FS. All of the latter stations are clear of the local QRM of New York City and work 3FB, Atlantic City, with ease. From 3FB the route is as follows:—3AS Ocean City, N. J., 3NB Vineland, N. J., and 3EH Collingswood, N. J., who has no trouble in clearing Philadelphia. If this route is utilized both ways we should have no further complaints. The Northern route via 3XM Princeton, N. J., which appears to be open is not being used to any extent, but efforts will be made to get our stations along this line in action again. 3EH Collingswood, N. J., as well as several other stations in the Philadelphia District are in daylight QSO range with Princeton, and inasmuch as the latter station is always in communication with New York, quicker service can be performed over this route than over the southern route, and some of the traffic should be diverted to this route to insure more prompt action.

The Hudson Valley route to Albany, Troy and cities to Buffalo will soon be in operation. So far New York City to Troy is open via the following stations: 2BK, 2DN, 2BB, 2DA, 2AR, 2BM, 2FG, 2XQ and 2SZ. The Superintendents of the Capitol and Western New York Districts are both working on a daylight Albany to Buffalo schedule. All stations in and around New York City should take advantage of this route, as in using same it will cut down delays and eliminate QRM.

The following gives in some detail the activities is each of the Districts under the jurisdiction of the Northern Section, as taken from the local reports of Superintendents.

WESTERN NEW YORK—Benzee Bros., Dist. Supt., 196 Keystone Street, Buffalo, N. Y. (District includes counties of Niagara, Orleans, Wayne, Cayuga, Oswego, Onondaga, Seneca, Ontario, Monroe, Livingston, Erie, Genesee, Wyoming, Yates, Cortland, Broome, Tioga, Chemung, Tompkins, Steuben, Schuyler, Alleghany, Cattaraugus, Chatauqua and Jefferson.) The Supt. reports that Buffalo has recently called upon the amateur to help solve the

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stolen automobile problem. Nightly bulletins pertaining to autos stolen are transmitted via radiophone from station 8PJ, Buffalo. The first bulletin broadcasted on April 4th brought about the recovery of machine the following day in Scranton, Pa. The Buffalo police are so pleased over results that they are planning to install a station of their own as in New York City.



Mr. R. W. Bissell, 8TY, has been appointed official station for Jamestown. During a visit to Jamestown, a hamfest was enjoyed with 8TY and 8AYM, who are wide awake and very much interested in our cause. The number of stations handling bulk of traffic during the past month are as follows: 8IL Lockport 138 messages, 8AMB Lancaster 42, 8AGK Niagara Falls 53, 8GI Rochester 128, 8AMM 51, 8AFA 17, 8AMZ Oakfield 200, 8AYM Jamestown 10, 8TY Jamestown 24 and 8HJ Elmira 10. The total number of messages handled by all official stations numbers 836. 8AMZ certainly has been clearing traffic in fine shape and his work is being greatly appreciated. 8ANJ has a working schedule with Canadian 3AB Toronto and traffic for Ontario Division points should be routed through Buffalo to 8ANJ.

CAPITOL DISTRICT (comprising counties of Lewis, St. Lawrence, Franklin, Clinton, Herkimer, Oneida, Hamilton, Essex, Warren, Fulton, Saratoga, Washington, Rensselaer, Schenectady, Montgomery, Madison, Chenango, Otsego, Schoharie, Albany and Delaware) Mr. F. H. Myers, Dist. Supt., 540 Providence St., Albany, N. Y. This is the newly created District and includes some of our best stations such as 2XQ, 2FG and 2SZ. Owing to the short time that this District has been organized nothing of much importance has yet been accomplished, but as soon as the New York City to Buffalo route gets into operation more will be heard from this District. All stations capable of doing good relay work and located in any of the above named counties are requested to send their names and addresses to Mr. Myers, so that he will be in a position to line them up.

HUDSON VALLEY DISTRICT (comprising the counties of Greene, Sullivan, Ulster, Columbia, Dutchess, Orange, Putnam, Rockland and Westchester) Mr. Carl E. Trube, Dist. Supt., 6 Livingston St., Yonkers, N. Y. This District has a number of excellent stations and is clearing a great deal of traffic. 2DN and 2BK both clear New York City and all traffic for cities along the New York to Buffalo route should be handed to them for relaying to 2BB, 2DA, 2BM and 2FG. These stations, in addition to 2OA, are a fine outlet for traffic destined to the New England States, and in the absence of a consistent route to New England points from New York City, messages should be routed via 2DN, 2BK or 2OA. Total number of messages handled by 2DA for past month was 177. Detailed reports from other stations are lacking. Mr. Trube has just recently taken hold of this District and it will take him a short while to get his stations lined up.

LONG ISLAND DISTRICT (All of Long Island east of Jamaica) Mr. Harry S. Collins, D.S., Babylon, L. I., N. Y. Although there is a comparatively small number of stations in this District each and every one of them are doing their share. Being far enough from the bulk of QRM from New York City, no difficulty is experienced in working distance. 2ZL Valley Stream has CW schedules with 1AE and 8th District stations and considerable traffic is cleared consistently. The same applies with 2BGR (spark) Bayshore, who maintains schedules with 1HO, 1BAB, 1BAZ, 1FW and 1BM. 2EL and 2AJW are also doing very good work. All of the above named stations are in communication with the Jersey resorts, and traffic for these points should be routed via them. 2AJW has recently installed a CW transmitter.

NEW YORK CITY DISTRICT (Manhattan and the Bronx) Dr. E. A. Cyriax, D.S., 219 East 71st St., New York City. The stations doing the bulk of the work in this District are 2DI, 2CT, 2IF and 2YM. In addition to these there are a number of others who are capable of doing distance work, but are handicapped by the terrible local interference. During the past month 2DI handled 94 messages.

BROOKLYN DISTRICT (All of Brooklyn and Long Island west of Jamaica), Mr. Frank A. Maher, Dist. Supt., 828 55th St., Brooklyn, N. Y. This District has quite a number of stations doing good work in face of the bad interference from local stations and ships entering the port of New York. 2RK cleared 450 messages working stations in all directions. Others that have been doing good work are 2OW, 2RM, 2BO, 2DR and 2WB.

SOUTHERN NEW JERSEY DISTRICT, Mr. Marcus Frye, Jr., D.S., Vineland, N. J. Traffic conditions have been very good during the past month, a number of the smaller stations coming into the limelight. At the present time the entire district is covered with daylight route, which has been brought about only through

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plugging on the part of Mr. Frye. The main stations handling traffic are as follows: 3BA 15 messages, 3AAN 23, 3EH 31, 3FB 43 and 3NB 184. The following are newly appointed official stations: 3EH, W. G. Phillips and H. Densahm, Collingswood, N. J.; 3LS, C. L. Roork, Penns Grove, N. J.; 3FB, Wm. Jordon, Atlantic City, N. J.

NORTHERN NEW JERSEY DISTRICT: Mr. Lester Spangenberg, 2ZM, has resigned as Dist. Supt. and Mr. Fredk. B. Ostman (2OM), 180 Broad St., Ridgewood, N. J., has been appointed in his place. Traffic in this district is being handled in very good shape. Business for Northern New York is now being temporarily diverted to other routes than through 8XU (Cornell Univ.) which station is experiencing induction trouble. The following stations are all handling distance in wonderful shape and clearing lots of traffic: 2TK, 2JJ, 2VA, 2AST, 2CL and 2JN. 2PE is now getting out with his CW, as well as 2ZM and 2AJF, who are also using CW.

Mr. Goette requests that station owners wishing to become official relay stations get in touch with their respective District Superintendents.

Mr. E. B. Duvall, Assistant Manager in charge of Southern Section, reports considerable progress during the month and a steady improvement in conditions.

WESTERN PENNSYLVANIA DISTRICT, Mr. R. C. Devinney, D.S., 1224 Boyle St., Pittsburgh, Pa. The stations in this District have again failed to make a report of messages handled, with the exception of 8ZD, who handled 165 messages. It is to be regretted that message reports are not received, as the failure to forward these reports prevents proper credit being received by this Division for messages handled. 8RU owned and operated by Allan McChesney and Charles Rankin, Pittsburgh, has been appointed as an official relay station. They have a fine station, and they will take care of the morning trick on Trunk Line B from 3 a.m. to 7 a.m. daily.

The following stations in this District have installed phone or CW for relay work: 8DV, 8ACF, 8JQ, 8FB, 8HA and 8WY. The station of the Traffic Assistant 8ZD is also being equipped with straight CW. 8DV and 8HA are doing the most consistent work, handling relay traffic regularly on their CW sets. 8FB has the best telephone set of the lot.

This District has again hooked up with the headquarters of the Central Penna. District at Milton through 8ZD and 8BQ. As fading signals from 8BQ almost always prevented us from working last season, we are quite elated to note that 8BQ comes through perfectly now.

The Doubleday-Hill Electric Co. of Pittsburgh are installing a high powered CW and phone set to be used largely for the purpose of handling business with their Washington, D.C., store. This station will be in working order in the near future and may be depended upon to handle A.R.R.L. traffic. Our official relay station at Uniontown, Pa., radio 8MT, is again on the job. 8VQ at Freeport is out of commission for a few weeks. 8JQ has given up his excellent spark set and is now working on a CW set. To sum up would say that, while relay traffic can be expected to decrease with the coming of heavy static and warm weather, from the number of CW and phone sets going into commission among our official stations, it seems likely that there will be more on the job this summer than ever.

CENTRAL PENNSLYVANIA DISTRICT, Mr. Herbert M. Walleze, 234 Vine St., Milton, Pa., states that traffic has passed through Pennsylvania during the last month much better than at any time since the reopening. The fact that 8BQ is again on the job and working a regular schedule (10 p.m. to 1 a.m.) is helping the situation. Mr. Walleze and his Traffic Assistant Cawley have consolidated their efforts on one station each using his own call (8BQ and 8HR respectively). Since reopening this station on March 15 they have handled 38 messages and are reaching out fairly well, having exchanged traffic with 1HAA, 8NB, 3EN, 8AMM and 9UU, and have worked Scranton (8ABQ) about 90 miles in daylight. Daylight tests with 8XE were very successful, both stations QSA and no fading, but at night both weaken considerably and fade badly. Daylight tests with 3AIC, 3GX and 3LP, Reading, Pa., are so far unsuccessful due to excessive QRM and induction at Reading. 3AQR at Hershey, Pa., a short distance east of Harrisburg came to life and QSR'd. This, however, opened a long closed branch into Harrisburg. This station (3AQR) should be able to pass traffic on down to York, Pa., and possibly direct to Baltimore. The ball is rolling now and with stations slowly coming to light there is no reason why we should not come up to standard with this District within a short time. Our great need now is a duplicate for 8XE for this summer.

EASTERN PENNSYLVANIA DISTRIC, Mr. S. W. Place, D.S., 622 Stanbridge St., Norristown, Pa., reports the following official relay stations appointed during the month: 3AIC Reading High School for Boys (Practical Arts Dept.), Chief Operator Fred. G. DeLong, in reliable communication with 3FR Allentown, 3HJ Haverford, 3WX Lancaster and 3ACS Whitford, 3AVG Yeates School, Lancaster, Pa., Operator Fred. B. Westervelt.

Traffic Assistant 8ZQ, N. E. section,

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reports that conditions in the Scranton district are very dull, and that the stations seem to take very little interest in handling traffic. He has, however, located and appointed a new station in Wilkes Barre, Pa., on Branch Line No. 1.

DISTRICT OF COLUMBIA, Mr. Francis M. Baer, D.S., 1744 Corcoran St., Washington, reports a great increase of activity in his District since his last report, and the following messages were handled: 3ALM 37; 3KM 13; 3ABI 9; 3XF 48. 3IW has also handled quite a volume of traffic, but no figures were received from him.

3KM is arranging a regular schedule with 1QR who will use CW. The CW set at WWV also has some good DX work to its credit.

Trouble is still experienced in clearing traffic to the south of Washington, principally on account of NAM's QRM with the Virginia stations and also due to static conditions. It is usually necessary to forward the southern traffic by mail. Local conditions in the city of Washington are still as good as can be expected in view of the numerous transmitting stations, and practically no friction is evident between the local and DX stations. This is almost entirely due to the influence of the Washington Radio Club.

EASTERN MARYLAND DISTRICT, Mr. E. B. Duvall, A.D.M., acting Dist. Supt., 3909 Cottage Ave., Baltimore, Md. reports that a change has been made in the traffic control station schedule for Baltimore, and although the schedule given in the last monthly report was not completely carried out as announced, the traffic control in the city was found to take care of itself to a certain degree. Until further notice the following stations will control and clear traffic through Baltimore:

3IB—Monday	3UC—Thursday
3AN—Tuesday	3HG—Friday
3GU—Wednesday	3EM—Saturday
3AC—Sunday	

Station 3AN is again in operation. 3IB, 3GU, 3AC and 3EM have been getting their signals out of late and are placed on the Control in order that their stations may have a chance to handle some of the traffic through the District.

3HG seems to have the lead on the DX stations in Baltimore, but no report as to the number of messages handled has been received; in fact none of the stations have furnished this information, and they are asked to co-operate with Mr. Duvall in the future and have this information in his hands before the 20th of each month. 3HG has a daylight schedule with 3ALN in Washington, and the two cities may be considered to be reliably bridged at present.

Mr. Duvall still holds the appointment open for District Superintendent for Eastern Maryland, and wishes to make it known that he will consider anyone who can satisfy him that they can handle the work efficiently in the full interest of the League, and possesses and operates an efficient DX station and who is a member of the A.R.R.L.

Many CW stations have sprung up in Baltimore. The leaders as far as DX work is concerned are 3CT, Hogan, who has been in touch with Pittsburgh and Cleveland on several occasions, and 3EQ, Holloway, who has been temporarily out of commission due to a habit he has formed of burning out tubes. Among the promising CW stations which are working and improving their sets for future DX work are 3IB, 3UC, 3ER, 3EM, and a set is being installed at the local store of R. Selway Collmus Co. operated by Mr. Winters Jones, who will no doubt come up with some fine DX work.

WESTERN MARYLAND DISTRICT (Comprising the counties of Frederick, Washington, Allegany and Garrett), Mr. Roger W. Clipp, Dist. Supt., Hagerstown, Md., has made no report.

Total messages 2226. Busiest station 2RK—450 msgs.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Reported by A. S. Clarke, Div. Traffic Mgr.

Excessive static has made good work next to impossible during the past month. Despite this the number of messages handled has shown quite a jump. There is an awakening of interest in radio throughout the division, many new stations being reported. No lagging of interest during the summer months is expected but rather more interest is being taken in developing day light communication.

District Supt. Wohlford of S.W. Virginia is making strenuous efforts to develop his section. Salem promises 3 good stations. Daylight communication one way with Salem has been established from Danville. The following appointments have been made, each man to assist Wohlford in his vicinity, Higgins at Oldtown to cover from Radford to Bristol; Gundry at Stonega for the Clinch Valley; and Fleenor at Bluefield for the territory lying between Bluefield and Williamson, W. Va.

City Manager White of Norfolk says that between NAM and busted condensers, relay men are having their troubles but msgs are going through. Both 3VV and 3FG, normally busy stations, have been out with busted condensers. 3EN takes second place for number of msgs. handled 53. XF-1 has done fine relay work handling 51 msgs.

Increasing interest in radio throughout W. Va. is evident. D.S. Heck, 8EF, reports

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daylight lines open from Mannington to Washington and Uniontown, Pa., and Cambridge and Marietta, Ohio. Liller at Keyser, and Rector of Bellington, W. Va., are counted on for good work before long. 8SP continues to be the star in this division.

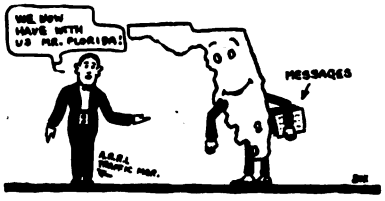
Reports have not been received from Blair at Richmond and Bunker at Charlotte. Blair at 3ZL is beginning to be heard. Daylight communication has been regularly established between 3BZ Danville and 4CK Winston-Salem.

The following stations handled the majority of our messages: 8SP, 3EN, XF-1, 3GO, 8JE, 8EF, 3ACT, 3VV, 3ACE.

Total msgs. 300. Busiest station 8SP—67 msgs.

EAST GULF DIVISION
E. H. Merritt, Mgr.

We made a record this month, fellows!! Over 25 msgs to FLORIDA passed thru 4YA, all to 4FD and 4GN. The route is at last working successfully and often thru very heavy QRM and QRN. No report from Florida D.S. Gulledge, but 4DL, 4AM, 4BI and 4CS seem to do the work for the whole state. They need help too, so let's hear from other Florida stations.



4XC is now D.S. for Georgia and all Georgia men please report to him each month. He is B. W. Benning, 50 Whiteford Ave., Atlanta, Ga. Dr. Hodge, Savannah City Manager, reports that 4GL, Mr. F. A. Hill, recently of the Roanoke Division, is operating on CW and doing good work. 4BY and 4GL are taking all the traffic thru there now. 4FD, 4BK, 4AG and 4GN are all doing fine work now. 4DV (Columbus, Ga.), 4BW and 4DT are heard occasionally trying to break thru the din. In Atlanta many of the stations are trying CW and fone work.

The best report comes from Dist. Supt. McIlvaine of 5XA. Alabama is coming to life. He has appointed Mr. H. L. Crane, 5JO, City Mgr. of Birmingham. 5EQ, 5JO and 5BQ are trying to get out. In Montgomery, 5NL and several others are working hard, and in Mobile 5KB and 5JZ have opened up. A radio club has just been organized in Mobile and promises some good DX stations next fall. 5XA is now on 375 meters with spark and ICW. A club has been organized there to back up and boost 5XA and is called "I Tappa Key". Mr. McIlvaine would like to hear from all stations in north Alabama at once.

QRN most of the time makes operation impossible now or at least very difficult but most of the stations are sticking to it and hammering thru. The D.M. earnestly requests that we keep the good work up and not close down for the summer as per usual. This QRN lets up occasionally, even in the summer months.

Total messages reported this month are 455 with only six stations reporting. Busiest station 4YA 125 msgs. Let's hear from you all next month.

DELTA DIVISION
J. M. Clayton, Mgr.

Owing to the approach of summer weather and summer QRN relay work thruout the Division has been very spasmodic. The good relay nights have about ceased to be, and when traffic is received it is a case of clearing it the same night, or waiting two or three weeks for a good night.

The fact that relay work is so slack possibly accounts for the fact that NO reports have been received from the Delta Division personnel. Again let me emphasize the importance of getting in some kind of a report MONTHLY to the Division Manager, or the A.D.M., if we are to have any representation in QST at all. Especially is this important during the summer months, as we all are more or less away from the stations during the summer months and the A.D.M. is unable to keep up with the various stations unless he gets a report from them.

It is hoped that we can put over a little relay work thru the whole summer, if we can build up two or three good C.W. stations in the division. Spark relay work is about impossible except on occasional good nights. And while on that subject the Division Manager would like to cast a few remarks on relay conditions down here during the summer, as compared with conditions in the north. Last September the Division Manager had the pleasure of being out at 9ZN one night, and noted Matty's exclamations and profanity over the "terrible QRN" then raging in the north. Despite this "bad QRN" the 2's and 3's were coming thru to 9ZN in fine shape and even a five station or two. Possibly the night that I happened to be at 9ZN was a particularly good night but nevertheless relay work CAN'T BE done here from May to October except on very rare occasions. We can't even HEAR the stations in the south during that time, much less work with them.

5YH has closed down his spark station for the season but is talking of putting in a semi-high power CW station. 5JD is still plugging along every fair night and

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clearing some traffic thru it all. 5ZAB (Pullen of Houma, La.—ex 5JE) hasn't been heard on the air for several weeks. 5EA hasn't been heard for a month or more. The suprise of the month was created when the Division Manager heard 5ZS the other night and gave him a msg. or two for Shreveport. Anthony came back with the news that he was at some fair or something. Guess Friend Willie was putting on an exhibition for the natives. 5ZK, Greenlaw, hasn't been heard on radio for some time either. DeBen, 5ZP, has been sick. We are expecting him on the air at any time. 5ZL has started up again, but this time the station is out at Camp Pike College at Camp Pike, Arkansas, where the D.M. is holding down a job as instructor in radio to men in Sam's Army. Incidentally Sam furnished the Grebe synchronous gap which is signing 5ZL now. The rest of the station except the oscillation transformer is 5ZL.

We hope to be able to run successful daylight tests thruout the division. Heretofore in past seasons these tests have been successful for maybe a week at a time and then it's absolutely impossible to get signals thru the QRN. Possibly this age of two steps and GOOD regeneratives will make some sort of relay work possible all the season around.

The Division Manager has had the pleasure of handling some traffic with Friend Merritt of the East Gulf Division. 4YA's signals certainly do come thru in fine shape over this way, and the D.M. is certainly pleased to have "connected" with the East Gulf Division Manager once during this season.

Again let me urge that you all get in some kind of a report each month to the Assistant D.M. If not at your stations let us know what you are doing and where you are. Also it is very important STILL that Greenlaw have a traffic report from you. Now that relay work has let up in this division ANY messages gotten thru will be of interest and we should get credit for any relay work done. Please let's have these reports.

Total messages, 180.

DAKOTA DIVISION
Boyd Phelps, Mgr.

Due to the early coming of the static season the good radio weather has been shortened considerably but we are not hanging up the phones on the peg and quitting. On the contrary we are making every effort to keep traffic moving over the Northern Route in some kind of shape all summer. As no stations have appeared in the western or central part of North Dakota the jump from Ellendale to the 7th district will have to be made when static conditions permit.

Station owners are encouraged to listen in every night all summer at least half an hour per night as there are frequently nights when static is so slight that distances of several hundred miles may be covered and the few stations that happen to be on the job clear many messages with little QRM. Last summer it was found that daylight working was very satisfactory where stations were within daylight range of each other. Some stations report better working conditions at noon while others think sunrise or sunset to be the best. This perhaps varies in different localities. Stations should test with their neighboring stations in nearby towns to determine the best hours. The Division Manager would appreciate a detailed report from each station on this subject and a list of the nearby stations that can be heard and communicated with regularly.

All routes in the eastern part of North Dakota are working and traffic is handled in daylight from 9LW at Wahpeton up to 9YAF at Pembina thru 9AEJ and 9AGN, and from 9YAF to Winnipeg, Canada. 9ZC at Baudette, Minn., clears daily with 9YAF at 11:00 A.M. and with 9AGN. Good stations are needed between Aberdeen, S. D., and Sioux Falls to complete a perfect summer route from the Midwest Division to Canada. The summer route from North Dakota to the Twin Cities is complete except for the last 60 miles from St. Cloud. Working north from the Twin Cities was always very difficult and communication was never established with the best stations in St. Cloud but the Division Manager is building a station at his summer home 18 miles from Minneapolis which will be somewhat nearer St. Cloud and equipped with every anti-QRN device now known. Summer station appointments will be made on the various routes when it is seen that traffic can be handled. Stations are still scarce in the southern and northern part of Minnesota and in the central part of South Dakota. Stations of any size whatever in these parts should write to their District Superintendents whose addresses were given last month.

Mr. Bridges of NUX, A.D.S., wishes to announce that his station 9DBT (ex "BQ") now has the call 9YAC. 9HM went out of commission April 2nd.

9WU and 9EE have combined their stations and are now operating under a special license—9ZX. It is to the untiring efforts of these two men that we owe thanks for the successful maintenance of our Northern Route. We can be assured right now of a perfect route via the North with these two men on the job. (Tfc. Mgr's. note: Goddard and Leavenworth have the chance of being to the Northern route what 5ZA is to our Southern route, and every indication is that they will give 5ZA a hard tussle

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for the honors. However, 9ZX will have a slight advantage in not having the QRN that 5ZA is used to, and in addition having two operators who are trying to prove that sleep is less desirable that moving traffic. More power to you, fellows.)

Individual station reports have been coming in better of late but there is still room for much improvement. Stations should get their reports to their District Superintendent by the 20th, especially their message totals so that we can prove we are handling summer traffic.

Total messages 332.

MID-WEST DIVISION
L. A. Benson, Mgr.

9JA, Dist. Supt. for Iowa, reports that even though QRM has been very bad and many dead nights, the traffic through the state has been heavy. Several additional stations have sent in their reports this month. Severe lightning and storms delayed somewhat, but with 9JN on again and 9AEQ coming in strong as ever, quite a bit of traffic was cleared through these stations and remarkable lot of west coast traffic is going through the state by way of 9JN and 9LW. 9MS and 9AWX are making DX records every night and 9YA has been heard several times on the west coast. 9CS is having no trouble in working the east coast regularly. 9DBS reports a route to Sioux city through 9ZU, as this station is opened again and has four operators. This station fills a link which has long been missing in the state of Iowa. Station 9MS works regularly at noon with 9CA, clearing traffic. 9YA has regular operators on every night working C.W., phone and spark. They have 1KW spark transmitter on 260 meters and 2KW on 425 meters.

9DU reports that traffic is moving over short jumps and in day time in his district due to QRN at night. 9AVK at Holden is doing good day-light work, working Columbia and Kansas City. It is sometimes impossible to work direct with 9YN but the best route so far is by way of 9AVK. Routes to the north, although still open, are not handling much traffic. Mr. Turner reports that C.W. is coming to the front in his district. 9KAB of Kansas City has a six tube set in operation. 9EL, Council Grove, Kansas, announces 9AEG Ira Graham, Eldorado, Kansas, has been appointed A.D.S. and 9OE of Wichita, Kansas, second A.D.S. These two men are working on day-light routes throughout Kansas to handle traffic during the summer months. 9EL is installing C.W.

Among some of the stations doing good work in Wichita are 9EUO, 9LAG and 9LV. 9PS and 9OE are the two most consistent stations at present. 9ZB has been handling all traffic lately using C.W. Several messages were handled direct to New York through 2ZL on evenings when QRN was so bad that spark stations were inaudible, using two 5 watt tubes. 9ZB has been reported QSA at Hartford, Conn. All stations in the Mid-West division using C.W. outfits at present are requested to kindly communicate with the Division Manager so that C.W. routes throughout the division can be maintained. 9LC of St. Louis has been doing excellent work with his C.W.

Total messages handled, 2124. Busiest station 9OE, 267 messages.

WEST GULF DIVISION
Raymond L. White, Asst. Div. Mgr.

Northern Texas District

Eastern Territory: John Dorsa, A.D.S., no report; however, Greenville reports direct that station 5HV handled total of 137 messages which makes him star station of that Territory.

Central Territory: Guy Neel, A.D.S., reports a club started in Dublin and activities increasing. Star station 5XJ.

Western Territory: J. L. Martin, A.D.S., reports conditions favorable; 5IF of Amarillo is doing some splendid relay work.

H. P. Heafer, D.S. of the Northern Texas District, has had prepared a special map of which he sent a copy to the Divn. Mgr., A.D.M., and all A.D.S's., which is indeed very up-to-date and if used will be of great benefit to all concerned.

A very interesting report from D.S. Tilley, of the Southern Texas District advises that Austin stations are now confined to only one, that being 5ZU, as 5EJ had his ninety (90) foot tower blown over and has gone to Colorado for the summer. 5JA's antenna rope broke so the whole system has to come down to get the rope through the pulley again. 5BO had two 70 foot poles blown down and the station has been closed for the summer. The University of Texas has an appropriation of $2,000 to equip their radio station; the antenna will consist of two 100 foot poles 200 feet apart with the latest Grebe receiving instruments installed, all of which are on the ground. A three (3) K.W., 240 cycle synchronous set is already installed and waiting for the antenna system to be finished The station will be manned by seven licensed operators recruited from the ranks of the Austin amateurs, with District Superintendent W. H. Tilley as Chief Operator.

5XI at Kelly Field, San Antonio, has been heard from, but there still remains for a real DX station to open up in that important city. All the small towns around Austin are regularly heard from, but the

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service is poor as most of the boys are beginners and cannot receive over 5 words per minute, with the wave length anywhere from 250 to 500 meters. (Note: Let's stop that 250 to 500 stuff; Wesley de White).

QRN is getting bad for summer work at night so the day-light routes are being lined up to keep the District on the map until O.M. Crimp puts in his appearance again.

Report from A.D.S. Daniels of the Houston Texas Territory, states that his office must of necessity report a very quiet district this month, unfavorable atmospheric conditions existing in that territory. Almost constant squalls and electrical disturbances have been prevailing since the last report was forwarded, this being the equinox period. On many nights it was impossible to copy 5XB who has been our most reliable short relay station.

Dist. Supt. Louis Falconi, of The New Mexico District, reports conditions exceedingly quiet, complaining of no monthly reports from his assistants, etc.

Traffic is still going west on good nights and when CW is installed at 5ZA operation may be carried on later in summer. 5XB comes through there with CW when spark is helpless.

Total msgs. 599. Busiest station 5ZA, 242 msgs.

ROCKY MOUNTAIN DIVISION
M. S. Andelin, Mgr.

During the month of March a great deal of the trans-continental traffic went via the Southern Route. The southern stations found very little difficulty working, and constant communication was maintained. The northern stations of this division have less static and consequently bear the burden of extra heavy traffic. Messages are passing over the trunk lines with the same regularity as the winter months and showing no signs of decreasing. It is possible that all-summer communication will be maintained; most of the DX stations are very enthusiastic over the probability of keeping the trunk lines open this summer. Never before has this been done in the Rocky Mountains.

The stations handling the bulk of traffic in April were 6ZH, 6ZA, 6ZM, 6WV, 9AMB, 7KX, 6JT, 6AEZ.

Total msgs., 587.

ONTARIO DIVISION
K. Russell, Mgr.

The past month marks both the height and approaching end of the relay work for the season 1920-21. Conditions in Toronto are such now that it is apparent that there are a number of amateurs shutting up their stations for the summer months.

In the east, the Ottawa Valley District of the Ontario Division has been formed with Major W. A. Steel, of Ottawa, as the District Supt. Under his efficient management, the Ottawa Amateur Radio Association has been formed and affiliated with the A.R.R.L. In the near future this district will form a most valuable link in the chain from Montreal to Toronto and Windsor. The most likely chain at present thru eastern Ontario is from Montreal to Ottawa, Perth, Napanee, Belleville and Kingston, Port Hope and Cobourg, and then to Toronto, with a branch line north to Peterboro, or perhaps the straight jump between Toronto and Ottawa may be managed through Peterboro, where a city Manager, Mr. F. H. N. Sherwood, has been appointed.

Reports from south-eastern Ontario are promising but things are still pretty much futurist there, with a tendency towards the development of C.W. Quite a bit of traffic is being handled between Napanee, Kingston, and Belleville, though this has been much curtailed owing to the 50 meter rule.

In Toronto, the usual amount of work is being carried on. The Manager's station has received a special license from Ottawa, new call 9AL, with allowance of 200 meters at all times, and communication with Pittsburgh and Salem, Ohio, has been established. Station 3FO reports having closed down. 3BP has dismantled his spark set also, owing to the opening of navigation, and is now using C.W. only. Communication has been had with 3B in Brantford.

There is talk of holding a convention in Toronto in the Fall, at the time of the National Exhibition, to try and get the Ontario amateur interested in relay work in the Province.

The Manager had a visit from D.S. Lloyd of Sault Ste Marie, Ontario, who reports that relay work is rather difficult in his locality, owing to the peculiar soil conditions, and metallic deposits along the north shore.

ALASKA DIVISION
Roy Anderson, Mgr.

Whew, what's that noise? Tuned to six hundred meters the operator at 7IT, Ketchikan, had a surprise, for suddenly a sound, not unlike induction, only of a much higher frequency was heard. It was unbearably loud on one or two points of the secondary condenser. But, thru it all, came the sound of a "spark". It proved to be NVH, Ketchikan, calling KDFA, Hyder. But, the mystery remained unsolved. Suddenly the noise stopped and did not start again so it was passed up as a freak. Later, however, on POZ's tune,

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some queer noise, not unlike that of a few hours previous, was heard. A little tuning on the arc set solved the mystery. It was Ketchikan's new arc. Unless on the proper tune it sounds like a sixty cycle spark, with a continuous induction-like-rumbling but when tuned properly, she delivers the goods in fine style. It marks the opening of the new thirty kilowatt arc station which has been installed by Mr. Hubbard, of Bremerton.

The installation of this arc set at Ketchikan marks a development in commercial radio, but for amateur radio, in and around Ketchikan, it hurts. One thing, they don't keep their arc burning when they're not sending. Let's hope they keep this policy up.

Ketchikan seems thus far to foster long distance receiving, regardless of QRM and QRN. Using a single bulb detector and 225 foot single wire aerial, elevated about thirty feet, POZ, NPM, NPN, NPO, NSS, WII, WSO, NPA and other high powered arcs are heard with a great regularity; most of them are heard every night or evening. On some occasions, others of less importance, commercially, are heard. Ships are heard all over the Pacific. NIO, the U. S. Navy Vessel KANSAS sent a TR report to Ketchikan naval station, and it was also heard by an amateur using a bulb detector and a makeshift tuner. At this time the NIO was using 4.2 kilowatt and was, I think, 3200 miles from Ketchikan. Anyway, it established a new record for naval 5 KW sets. Let's keep it up.

NORTHWESTERN DIVISION
John D. Hertz, Mgr.

Summer is nearly here but still only a slightly increasing difficulty is experienced in handling traffic, and the CW sets now on the air seem to be having even less difficulty. It is getting to be more and more difficult to work 7CC, while on the other hand more luck is had between Portland and Seattle. Work north and south is as regular as ever.

In Montana, Asst. D.M. Cutting is very optimistic over the outlook for keeping the Northern Route open all summer. And he is doing his part well, by tearing up the air with his station 7LY, which works 9's on the east, gets south well, and tears in at Seattle and Tacoma, tho is not as loud in Portland.

Mr. E. L. Wharton, 7EX takes the "cake" this month for amount of traffic handled with a total of 384. Do any of the other transcontinental routes handle as much traffic?

7ZG being a "tiller of the soil", does not find as much time for radio work at present due to spring farm work. As a result he will not be with us as often.

7ZM (Ex-7CC) is apparently suffering the worst due to QSS. Still he is on quite regular and is trying hard to keep his end of the line open.

7YA at Boise offers a good alternative route for "east and west" business, and he gets his share, most of which goes via the Montana stations 7EX, 7ZG and 7LY and some direct to the ninth district. He seems to be taking the bulk of the eastern business from Central and Northern California.



7FI and 7BQ at Pullman are also coming to the front in the relay game, and make good alternates for 7ZM. They are handling considerable traffic with 7BK and 7AD to the west, also 7CN and 7BD in Portland; but, with 7ZM, find it hard going east.

7FQ at Tekoa, Washington is beginning to get out, and works Spokane stations.

In Seattle 7BK, 7AD and 7CA are the principal stations this month, 7BK taking the bulk of the business, as 7AD is conducting research work along the radiophone end of the game.

Mr. Hunter Onstine, 7LS, of Ferndale, Wash., is a new arrival in the relay game. He is in communication with 7IY at Vashon Island who in turn works both east and south. This opens up a new district which has heretofore been dead to the world. This station together with 7FO in Everett, Wash., makes up the long lost route to Canada, where 5BA and others await.

In Tacoma 7CE does the best work with 7BC a close second. 7CB and 7BA also get out and are doing their part to make Tacoma the second largest relay center in the Pacific Northwest.

A new station appears at Hoquiam, Wash. on Gray's Harbor; 7NN, who works 7BK, 7BQ, 7BC and others. This opens a district that has been dead since before the war.

In Eugene a new D.S. is due for appointment. Therefore, no report has been had from there. Portland, while still the largest relay center of the Pacific Northwest, is losing many of its men. 7BP has dismantled for the summer, and is commercial operating in Alaska. The D.M. is leaving at the time of this writing for another point in Alaska. 7DS has been out of commission for some time. 7ZI has dismantled his spark set and is now con-

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Amateur Radio Stations

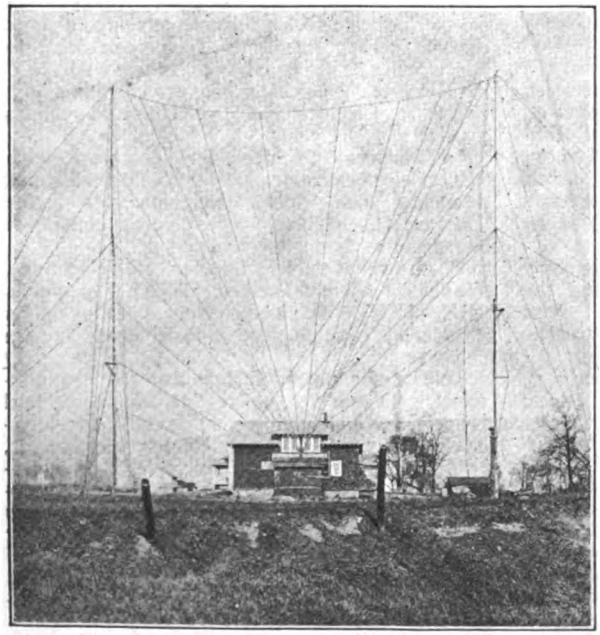


8ML, CLEVELAND, OHIO

Here's a station that, like 8ZR, has a real set of masts. 8ML is the station of Mr. Frank M. J. Murphy in Cleveland, and is one of those stations that have helped to make the Amrad gap famous.

To jump right into a description, the front mast (left) is 112 ft. high, 68 ft. being of timber and the balance of 2" and 1½" pipe, while the rear mast is two feet shorter, of similar construction, with 100 ft. separating the two. In this space is hung a ten-wire fan aerial, the wires being of uneven spacing so as to provide the same length of current path for every wire and its neighbor, regardless of their distance from the center of the system. A top cable of 7-strand No. 20 bronze, insulated with two 10" Electrose insulators at each end, carries the fan, which is made of Jupiter 7-strand No. 22 copper. Mr. Murphy estimates that he put up these masts 50% with the help of Mrs. 8ML, 40% alone and 10% with the help of interested neighbors. He threatens to put up another so as to have a triangular inverted cone, from which we see that a few more 112-footers are nothing in his young life.





The transmitter shack, under the center of the aerial is 10' x 12', made of scrap lumber left from the construction of the house. The transformer is a 1 k.w. open-core United Wireless with a home-made primary winding, while the condenser is made of 22 sheets of 8 x 10 copper and 44 sheets of 11 x 14 photographic glass immersed in coil, capacity not known to us. Two ½-k.w. Amrads form the gap equipment, while the O.T. is a "he", home-made with one-inch copper tubing for the primary and 2½" ribbon for the secondary. Either 8ML's aerial is a bit too ambitious or his wave meter lies, for he finds it impossible to get down to 200 meters without a series condenser, and two .002 mfd. Marconi jars are used in series in the ground lead for this purpose. Notwithstanding the inevitable loss in such an arrangement, 8ML is QSA everywhere

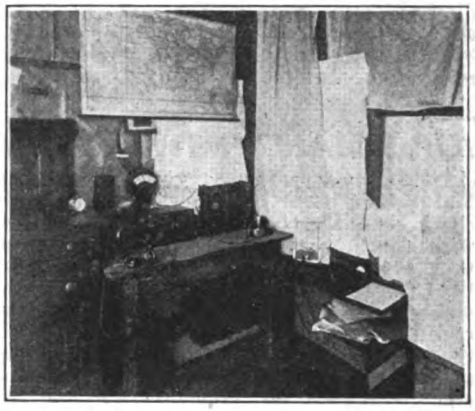
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within a respectable range, and has been reported from 7ZJ, Vancouver, Wash.

8ML also uses one of "Round's round grounds", made of 8 sheets of 3 ft. x 8 ft. Armco galvanized iron, set edgewise in a trench 5 ft. deep and 21 ft. diameter, surrounding the shack. Two leads of No. 10 R.C. wire run to each plate.

The transmitter is mechanically controlled from the operating room, 40 ft. distant. The receiver comprises a Grebe CR-3, audiotron detector, home-made 2-step amplifier using Acme transformers and Radiotrons, Baldwin phones, and Edison A batteries.

The details of the arrangement, we believe, will speak for themselves.



6XAD, AVALON, CATALINA ISLAND, CALIF.

Not a vast amount of explanation is needed, in order to grasp the details of 6XAD, ex-6BX, the very efficient station at the residence of U.S. Deputy Fish and Game Warden Lawrence Mott, on Catalina Island, thirty miles off the coast of California. Mr. Mott is the well known author, and his hobbies are fishing (note the photograph—courtesy P. V. Reyes, Avalon), big game shooting, and radio. His receiving apparatus consists of a Kennedy long-wave and a Grebe short-wave CR3 regenerative receiver. He employs a two-step Grebe amplifier for both, in conjunction with an audion detector and Baldwin 'phones. The transmitter is a C.W. set, operated on city current, and using from three to five VT-2's. Mr. Mott is now experimenting with the new U.V. 202's, finding them most satisfactory. The transmitter is so built that any of several wave lengths is instantly available.



6XAD has been reported QSA as far north as Vancouver, down in New Mexico, and as far east as Pittsburgh. The antenna is an inverted "L", max. height 70', 4 wire, No. 14 soft-drawn copper. Grounds are water pipes and a 7' x 12' sheet of ¼" copper, buried beneath the antenna.

For reception on his Kennedy he uses a single wire, 300' long, and he claims he hears *all* the power stations of the world. His antenna current, transmitting, is from 1.5-3 amps.

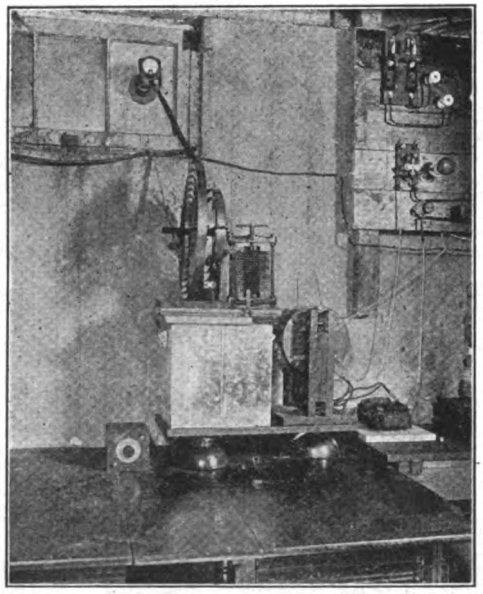
Warden Mott is extremely anxious to

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make up a schedule for serious long distance work with C.W., with interested amateurs, and asks that he be reported by postal card. He uses 200 and 225 meters.

1QP, S. MANCHESTER, CONN.

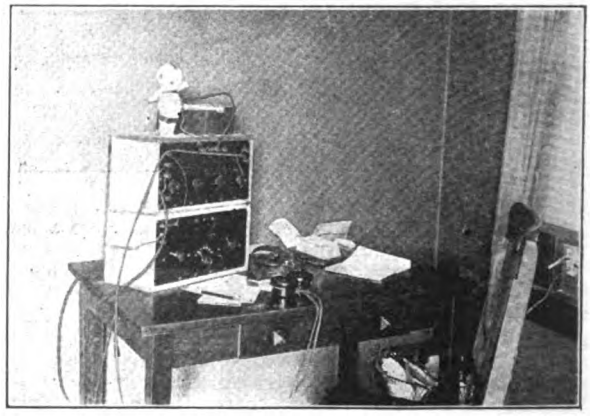
1QP, owned by John L. Reinartz at South Manchester, Conn., is another of the stations that are doing splendid DX work with Amrad gaps. Our photographs show that his equipment is neat and business-like, the receiver being mounted in an up-stairs room from where operation of the transmitter in the cellar is remotely controlled. The aerial is a slanting flat-top of large gauge aluminum wire with one end on a mast on the house and the far



end high up in a tree. Each flat-top wire and its corresponding vertical wire are in one piece, doing away with the almost hopeless proposition of soldering joints in aluminum wire.

The receiving tuner is of the type described elsewhere in this issue, so nothing more will be said of it here except to state that it works fine. The tube equipment is a detector-three-step and is quiet. 1-Kewpie's mascot adorns the top of the tube cabinet.

The transmitter consists of a home-made transformer with a secondary wound in pies and giving a potential of about 40,000 volts; a home-made glass plate and foil condenser immersed in oil, a Thordarson oscillation transformer, and an Amrad quenched gap remodeled to handle a greater voltage per gap than customary. In the power line is placed a large constant-duty rheostat of commercial make capable of giving a gradual and even control. By the adjustment of this resistance 1QP can vary his note from 30 cycles to 500 cycles. The antenna current is highest at the high frequency but 1QP is wise and knows that it is the power in each wave train that counts and that his condenser voltage builds up highest at the lowest frequency. Consequently he is at present using a 30 cycle note which, while not particularly pleasant to hear and sometimes sounding like static, certainly has the punch behind it and reaches out. During the Amrad transcontinental relays 1QP gave a fine performance and was regularly QSO 9PV on 200 meters and with a note of 30 in Chicago. The normal antenna current cycles is about 3 amperes.



OPERATING DEPARTMENT

Report of Northwestern Div.

(*Concluded from page 39*)

fining his activities entirely to the development of C.W. 7JW, 7ED, and 7DA are the principal sparks handling traffic.

In Vancouver 7ZK and 7CM continue steady. 7BS is off for the summer, having also gone to Alaska commercial operating.

A.R.R.L. work of the Division has been turned over to Mr. R. T. Galyean, 460 Miller Street, Portland who will discharge the duties of the office from the present date.

Busiest station 7EX, 384 msgs.

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Who's Who in AMATEUR WIRELESS





CLIFFORD J. GOETTE

Mr. Goette, Assistant Manager of our Atlantic Division, is the well known operator of Station 2JU at Woodhaven, Long Island and accordingly needs no introduction to our readers altho we are all glad to see what he looks like.

Goette is one of the old-timers, having become interested in radio in 1908 while employed at a local railroad telegraph office on a 12-hours-per-day job. Between clearing "19's" and "31's" he managed to find time to read up on the subject, which was then decidedly in its infancy, and erected a small spark-coil transmitter. Being unable to connect up with FV, now 2ZV, A. H. Grebe, Jamaica, L. I., but little over a mile away, he decided he needed more kilowatts and so installed a transformer and eventually had a range of 25 miles.

At the outbreak of war Goette joined the Signal Corps and was assigned to Radio Tractor Units in the Military Intelligence Branch, serving along the Mexi-

(*Concluded on page 57*)



S. KRUSE

Hurray! We finally got a photograph out of Kruse, but it was like pulling eye-teeth!

It gives us a great deal of pleasure to present this likeness of "LQ" to our readers, for we are proud of him and his ability. He was born in Halstead, Kansas, (doesn't say when) but insists he is proud of the place. The scheduled interest in radio was born upon reading an article in McClure's, describing Marconi's first transatlantic tests, and he started playing with a coherer set in 1907, eventually hearing Fort Leavenworth's 2 k.w. fixed gap set twenty-seven miles away, an accomplishment which was fittingly celebrated. He went thru engineering school at Kansas State University at Lawrence and while there operated old 9LQ (whence the present personal sine "LQ), also old 9XP. 9LQ was a part of the old 9JW-9EP-9LO-9DM-9ABD-9MQ gang that relayed thru Kansas and Missouri in the good old days, and was a good station without question, as it

(*Concluded on page 57*)

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More Transcon Dope

The following additions to the story of the Transcons as reported in the March QST have been received:

Transcon 14 msg. nr. 2 was originally reported stalled at 6ZH. 6ZH gave it to 6ZA, but received no QSL. 6ZA passed it to 6ZO, while 6ZH continued his endeavor to pass it on. Unfortunately he developed condenser trouble but gave it on low power to 6JD who was unable to work west until 3:30 A.M. mountain time, when he passed it on to 6KA. So it finally got to Los Angeles after all.

Transcon 15 reply nr. 3 was reported stalled at 6JT. 6JT is now reported as having given it to 6KA and QSL received, but no time reported.

Transcon 16 reply nr. 1, reported stalled near 1FU, actually got through as it was copied direct at 1FV in Portland when 1AW gave it to 2RK, although no QSL could be given.

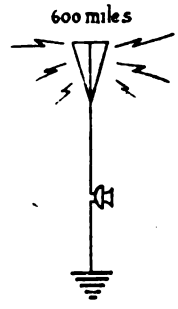
According to "QTC", published in Rochester, the reason C.W. is so popular is that it means "Caressing Women".

An amateur entered our cell the other day and talked so much about a telephone station whose carrier wave he could constantly hear but who never talked, that we were prompted to investigate, and so we went out to his shack and asked him to tune in this fellow. With a certain adjustment on his regenerator, his bulb howls beautifully. We didn't have the heart to tell him what it was.

We are proud of the city of Lafayette, Indiana. Professor R. V. Achatz of Purdue University, City Manager, reports he has his city tuned down to 200 meters, and has personally checked up every station under his jurisdiction, with several of the smaller stations operating on 160 and 180 meters. Let's have more cities like Lafayette.

We have felt obliged to discontinue the two pages in QST known as "Directory of Calls" because calls are being issued at such a rate as to make it hopeless for us to keep up with them in the limited space available.

From the New York American:



"Minister's sermon carried 600 miles by wireless..... In delivering his sermon he simply spoke into the mouthpiece of an ordinary telephone transmitter which was connected with the aerial."

And all the while we have been wasting our time arguing about grid modulation versus Heising modulation and what not!

Station 2RK has been indefinitely closed for an alleged interference with the U.S.N. compass station at Sandy Hook on 800 meters. While that charge in itself is subject to considerable question, it is reported that 2RK continued operation after having his license suspended, and is now charged with that, with operating on an illegal wave length, with operating CW equipment not covered by his license, and with signing the letters "KH" for a call. If the charges against Hewitt are substantiated, it is probable that 2RK will be no more.

We again point out to our members that the radio laws must be obeyed.

In the catalogue of the Charles William Stores we find a nice picture of the well-known Arlington receiving transformer, price $9.98, and under it these illuminating words: "Same as used at Arlington wireless station. Wave length 4,000 miles."

Things we want to know:

Where a ground lead ends, and the real ground begins.

The truth about power factor in an oscillating circuit.

The why of a resonance transformer.

When 1TS sleeps.

Why 8ZL reaches out.

How to eliminate induction in the nearby wiring.

In the first item in "Strays" in March QST, we requested data from A.R.R.L. men who served in radio during the war. Do you mean to say that no more of you

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chaps who haven't dropped us a postal giving us the desired information were in the radio service? Shake a leg, fellows, and send in the dope as we want to have a complete roster of what we did during the war.

We certainly like the action of The Benwood Co., Inc., in stimulating summer interest by their offer of monthly prizes for the best operation during the hot months. If all the manufacturers would get behind the gang in this manner, things



The Benwood Store, St. Louis.

would certainly hum during the dog-days. We thank the Benwood Co. for this and hope that other manufacturers will evolve ideas of special interest during the summer months, as we know they will surely redound to the benefit of all concerned.

Have you tried the Turney Spider-Webs? With a couple of variables they certainly make a neat and serviceable little regenerative tuner. They work fine and they are great for a portable set too.

If you have your transmitter in a dog-house or bird-house in the back yard, put a padlock on it. According to "QTC" a Buffalo amateur had his entire transmitter stolen recently. It was set on a pole in his yard and operated by remote control.

The "Richmond (Indiana) Palladium" anounces the installation of radio apparatus as part of its regular news gathering machinery, with call letters 9SS.

Station 8AYM is owned and operated by C. M. Nichols of 8ACM and if heard please forward cards to address of 8ACM. The station formerly had another operator, R. W. Bissell, but he has dropped out of 8AYM in order to have time to operate his own station 8TY.

Hints for QRM Makers:

Don't sit on your key. It is tiresome and a brick is much more convenient.

Never use a Helix or O.T. They are too expensive.

Never copy a message, memorize it. Paper is too expensive.

Don't answer the fellow who calls you. He likes to call because it lets the other fellows know that he is on the job.

A correspondent wants to know, now that we have synchronous gaps, how to set the rotor so as not to blow all the condensers in the country. That's just it, OM, the idea is to adjust it so as to get that maximum voltage that punctures every ordinary condenser and then build a he-condenser that will hold it and thereby get some real juice out of the old set. But it surely does take a condenser.

Speaking of records: 2BK is reported heard by 6KA in Los Angeles about 4:38 A.M. E.S.T., April 19th. About the same time next day 9OE and 9PS both called 2BK saying "QSQ 6KA", so it would seem that 6KA heard 2BK on two occasions. But that isn't all; we have a postal from 8AGK, Lancaster, N. Y., advising that at 4:30 A.M. April 20th, he heard 6KA calling 2BK.

8ZA was copied by 6EJ, Walnut Grove, Calif. on January 19th.

3HJ has been heard 200 miles west of the Azores, a distance of 2300 miles.

9LC, Bill Woods, St. Louis, has now been heard in Portland, Maine; Los Angeles; Ontario; Telos, Cuba; and most places in between, all on ½ KW.

"A. Novice" recently complained about the straps on his honeycomb coils "perspiring". 2ATV discovers that celluloid makes a wonderful substitute that stands the hot weather OK.

1AW is now broadcasting reports of automobiles stolen in Hartford and other important police news daily at 9:30 P.M., E.S.T.

Not that we care, but dijjanotice that Sears-Roebuck's artist found out what a radio station looks like from Hoffman's drawing on our October cover? See the circular illustration on the rear cover of their catalogue.

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Calls Heard



HEARD DURING APRIL
Unless Otherwise Specified

Instructions to reporters:

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

HEARD AT SEA.

J. C. Taylor and L. S. Butler, aboard U. S. S. "Buffalo", at San Diego, Calif.: 5ES, 5ZA, 5ZZ, 6XZ, 6EA, 6ED, 6EJ, 6FI, 6GK, 6HR, 6HP, 6IC, 6IF, 6IM, 6JQ, 6OC, 6PR, 6XC, 6AIW, 7BX, 7ZI, 7ZJ, 8ZC, 8ZU, 8ZV, 9UU, 9TI, 9ACD, 9ZN, 9ZL, 9DIN.

T. W. Braidwood, Opr. KOSM, Mar. 11, 350 miles east Portland, Me.: 1CY, 1XM, 1GBC, 3HG, 3ZB, NSF. Mar. 12, 645 miles east, 1AE, 1ARY, 1EAV, 2YM, 3DH, 3DN, 3HJ, 3RK, 3SK, 8ML, 8AMZ. Mar. 14, 1250 miles, 3DH.

CAN. 9AL, TORONTO, ONT.

1RD, 2ABR, 2BML, 2XQ, 3AAE, 3CC, 8AGZ, 8BO, 8IV, 8JM, 8JW, (8LF), (8PJ), 8XB, (8ZG), 8ZN, 8ZZ, 9AZX, 9AJA, 9XI, 9XM.

CAN. 3KU, NIAGARA FALLS, ONT.

1AW, 1CK, 1DV, 1FW, 1GB, 1IA, 1JA, 1LZ, 1QP, 1RZ, 1TS, 1VV, 1XK C.W., 2BG, 2BM C.W., 2DA, 2DR, 2EL, 2EN, 2JJ, 2RK, 2RM, 2VA, 2UK, 2XX C.W., 2VE, 2ZL C.W., 2ZM C.W., 2LR, 3AAO, 3DS, 3EN, 3KM, 3PU, 3XM, 4XB C.W., 8AAX, 8ABT C.W., 8DR, 8AGK, 8AGZ C.W., 8AJR, 8AKX, 8AMQ, 8ANK C.W., 8ANR, 8ANT, 8AOA, 8APB, 8ARS, 8AXQ, 8AXQ, 8AYJ, 8BB C.W., 8BU, 8DR, 8DS, 8FO, 8GI, 8HR, 8IK C.W., 8JW fone & C.W., 8LQ, 8MB C.W., 8NB, 8OZ, 8QM, 8SB, 8SP, 8WE, 8WV, C.W., 8WY, 8XU, 8LB, 8LN C.W., 8LR, 9AEQ, 9AO, 9BY, 9IP, 9LQ, 9MC, 9XI C.W., 9XM C.W., 9ZN. CANADIAN—3BA, 3BP, 3CA, 3CO, 3DS, 3EP, 3FK, 3LE C.W. & fone, 3AQ, 9AL C.W. & fone, 9AJ fone.

1TS, BRISTOL, CONN., One Tube

Spark stations: (1ACZ), (1AW), (1BBL), 1CBJ, 1CBT, 1CCL, 1CK, 1CM, 1CY, 1DAL, (1DAP), 1DR, 1DY, 1EBW, 1EP, 1FBF, (1GAI), 1GAN, 1GAS, 1GBC, 1GM, (1GY), 1HAA, 1HBT, 1IA, 1JAP, (1JAU), (1JBF), 1JQ, (1JX), 1KAC, (1LAP), 1LBR, 1MAD, 1MBS, 1NAQ, (1NAT), 1NBJ, 1NBP, (1OAA), 1OAD, 1OBE, 1OBH, 1OE, 1OJ, 1OT, 1PG, (1QP), (1QT), 1RAD, 1RAK, (1RAY), 1SBS, 1SN, (1SZ), 1TBJ, 1TL, (1UJ), 1UN, 1UQ, 1WR, 1XM, 1YB, 2ACD, 2AFP, 2ALY, 2AR, 2BEH, 2BGH, 2BGR, 2BK, 2BLP, 2BM, 2CL, 2CO, 2CT, 2DA, 2DI, 2DN, 2DX, 2EL, 2FG, 2JJ, 2JU, 2MG, 2MX, 2OA, 2OM, 2OW, 2PL, 2RK, 2RM, 2SS, 2SZ, 2UA, 2ZM; 3AAN, 3ACE, 3ACM, 3ACT, 3ALN, 3BG, 3BZ, 3CC, 3CK, 3DH, 3DS, 3EN, 3FJ 3FR, 3GO, 3HG, 3HJ, 3HX, 3IB, 3IM, 3KM, 3LP, 3NB, 3OU, 3PU, (3RW), 3UF, 3VV, 3XF, 3XM, 3ZA; 4FD; 8ADK, 8ADQ, 8AGD, 8AGK, 8AIO, 8AL, (8AMM), (8ANT), 8AOT, 8AP, 8AFB, 8ARD, 8AVD, 8AWP, 8AXO, 8BB, 8BC, 8BQ, 8CG, 8CH, 8DR, 8DY, 8FE, 8FK, 8FQ, 8GI, 8HA, 8HF, 8HR, 8HY, 8ID, 8IL, 8IN, 8KZ, 8LQ, 8ML, 8MM, 8MZ, 8NI, (8PT), 8QC, 8QE, 8RQ, 8SP, 8TN, (8VW), 8WY, 8XE, 8XU, 8ZA, 8ZD, 8ZR, 8ZW, 8ZX, 8ZY; 9HJ, 9HR, 9K, 9IQ, 9UH, 9YB, 9ZJ, 9ZN; Canadian 2DD.

C.W. stations: (1AB), (1AE), 1BAY, 1CK, 1DBZ, (1DH), 1DR, (1DT), (1FBK), (1GAI), 1HBA, 1HBP fone, (1IBF), 1II, (1JBF), (1KAZ), (1KBL), (1MO), (1NAQ fone), 1NBA fone, 1NBS, (1RD), 1RZ, 1UD, 1XD fone, 1XE fone, 1XV fone, (1XX fone); (2ADL), 2AJF, 2AJW, 2AKO, 2AZP, 2BDU, (2BML fone), 2FD, 2HI, 2HZ, 2PE, 2UD, 2ZA, 2ZQ, 2XX, 2XL fone, 2ZM; 3AAE, (3AAO), 3ABI, 3CC, 3JC, 3LE; (8AGZ), 8AJ, 8AKE, (8APH), 8ASM, 8BO, 8DR, 8GA, 8HI, 8IB, 8IV, (8JM), 8JU, 8KM, (8LF), 8LV, 8OH, (8PJ), 8UJ, 8UK, (8VS), 8XK fone, 8XN, (8YG fone), (8ZG), 8ZN fone; 9AJA, 9AZX, 9XI, (9ZB); Canadian 3AB, 9AL; (NMW), NSF, WWV.

1OBK, SOMERVILLE, MASS.

1HAA, 1NAQ, 1SBZ, 1TS, 2AX, 2AFP, 2AJF, 2AOF, 2BM, 2DN, 2DY, 2EL, 2FG, 2JJ, 2JN 2JU, 2MME, 2MZ, 2OM, 2OU, 2RK, 2RM, 2UA, 2UC, 2UK, 2VD, 2XM, 2XP, 2ZC, 2ZL, 2ZM, 3AAE, (C.W.), 3CC, 3EN, 3EV, 3GO, 3HG, 3HJ, 3HX, 3IB, 3IW, 3KM, 3NB, 3OU, 3PU, 3RW, 3XM, 3YK, 3YV, 8AG, 8AGK, 8AMQ, 8AMZ, 8AVD, 8AWP, 8AXC, 8BC, 8CG, 8DZ, 8FK, 8GI, 8HR, 8KZ, 8RQ, 8SP, 8UE, 8WY, 8XB, 8XK, 8YG, 8ZD, 8ZG, 8ZW, 9KF, 9ZJ, NSF, WWV.

1MO, F. H. Schnell, 134 Oakland Terrace, Hartford, Conn.—All C.W.

1AE, 1BV, (1FQ), 1GAL, (1KBW), (1NAQ), 1NBA, 1NO, 1RD, 1SZ, (1TS), 1UN, (1VAD), 1XM, 1XV, 2ACZ, 2ADL, 2AJF, 2AJW, 2AKO, 2BB, 2HI, 2XA, 2XAC, 2XX, 2ZL, 2ZM, 3AAE, 3AAO, 3CC, 4GL, 8DE, 8DZ, 8IB, 8IV, 8YG, 8ZN, 8ZV, 9XI, NMW, NSF, NHT, WWV, XB1, XF1.

1XM, CAMBRIDGE, MASS.

1AW, 1HAA, 1MAD, 1OE, 1RAY, (1's too numerous), 2AC, 2ADB, 2ADM, 2ALD, (2BK), 2DI, (2DN), 2DR, 2EL, 2FG, (2JU), 2OA, (2OM), (2OW), (2RK), 2SZ, (2UK), 3AAD, 3AAE, 3AAN, 3AAO, 3ACM, (3ACT), 3AFE, (3AHK), 3AJD, 3ALN, 3ABC, (3BG), 3BP, 3BZ, (3CC), 3CCM, 3DY, (3DS), (3EN), (3EV), (3GO), (3HG), (3HX), 3IB, (3IW), 3KK, (3KM), 3MF, (3NB), 2ND, 3OS, (3OU), 3PF, (3PU), 3QF, 3UU, 3VJ, 3VM, (3VV), (3XF), (3XM), (4BY), 4YA, 5ZA (Confirmed), 8AR, 8ABZ, 8AW, 8AEE, 8ACM, 8AEF, (8AGK), 8AIO, (8ANT), 8ARD, 8AWP, 8AWX, (8BC), 8BO, (8DR), 8FU, (8ID), 8JE, 8KZ, 8LD, 8MC, 8MG, 8ML, 8MM, 8MR, 8MZ, 8NZ, 8OZ, 8PX, 8QE, (8RQ, (8SP), 8WV, 8WY, 8XE, 8XK, 8XU, 8YN, 9AR, 9AW, 9AAQ, 9AAW, 9AWZ, (9CA), (9DLX), 9GJ, 9GP, 9HJ, 9JN, 9KF, 9MS, 9NQ, 9NW, 9OE, 9UH, (9UU), 9XU, 9ZJ, 9ZN, (NSF), (WWV), (WZAA), XF1.

1OBE, NORWICH UNIVERSITY, NORTHFIELD, VERMONT

1AE, 1AW, 1BAY, 1BB, 1CAO, 1CCY, 1CF, (1CK),

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1CM, 1CY, 1DAC, 1DAL, 1DY, 1EAV, 1FV, 1GBC, 1GBT, 1GM, 1GY, 1GP, (1HAA), 1HAF, 1HBZ, 1HO, 1IA, 1JZ, 1MAD, 1MBA, 1MBS, 1OE, 1OJ, 1PAO, 1PAZ, 1PG, 1QR, 1RAD, (1RAY), 1RV, 1SBZ, 1SW, 1SY, 1SZ, 1TS, 1XM, 1XF, 1YB, 1YP, 2AH, 2AJ, 2AJF, 2AR, 2ARA, 2AS, 2AWF, 2AWO, 2BG, 2BGR, 2BK, 2BM, (2BML), 2CC, 2CT, 2CM, 2DA, 2DD, 2DI, 2DM, 2DN, 2DX, 2EI, 2FM, 2GR 2IM, (2JJ), 2JU, 2OA, 200, 2OW, 2QR, 2RB, 2RK, 2RL, 2TK, 2TS, 2UA, 2UK, (2VA), 2XA, 2XK, 2XQ, 2ZM, 3AHK, 3ABG, 3AGR, 3BZ, 3CC, 3DM, 3DS, 3EN, 3EV, 3FR, 3GO, (3HJ), 3HX, 3KM, (3NB), 3OBD, 3OU, (3PU), 3UC, 3VV, 3XI, (3XM), 3ZE, (3ZL), 8ACE, 8ADQ, 8AGD, 8AIO, 8AGK, 8AGO, 8AMM, 8AVD, 8AWP, 8AXC, 8BC, 8BV, 8CD, 8FE, 8GI, 8HR, 8IN, 8IL, 8JM, 8KZ, 8LQ, 8ML, 8NI, 8MI, 8OW, 8PO, 8QM, 8RQ, 8SP, 8WY, 8XE, 8XU, 8XK, 8ZA, (8ZD), 8ZN, 8ZR, 9HJ, 9ME, 9ZN, 9ZJ.

2BML, RIVERHEAD, LONG ISLAND, N. Y.

1AEE C.W., (1BAB), (1BBL), (1CBT), 1CK, 1CP, 1CY, 1EBW, (1FBV), (1FV), (1FW), (1GAI), (1GAV), (1GM), (1HAA), (1HO), (1JAP), (1KBM), (1LBR), 1MAD, (1MX), (1NAZ), (1NBP), (1OAL) C.W., (1OBE), (1OE), (1QP), 1QW, 1RAK, 1RAS, 1RAY, (1UQ), 1XM, 1YB, 2ADL) C.W., 2AHK, 2AJW, (2BGR), 2CT, 2FG, (2HI) C.W. & fone, 2OM, 2RK, 2SZ, 2UK, 2ZL, 2ZM, 3AAE, 3AAO, 3ACK, 3AHD, 3BZ, (3CC), 3DM, (3EN), 3FG, 3GO, 3HB, 3NB, 3OA, 3PU, 3UC, 3UQ, 3XM, 3YK, (4BI), 8AC, 8ACC, (8ACF), 8AGD, 8AGK, 8AHD, 8AOT, 8ARU, (8AXC), 8BC 8BO, 8BV, 8FQ, (8HR), 8HY, 8IL, 8IN, 8KP, 8NI, 8PJ, 8PM, 8PU, 8RQ, 8SP, (8SH), 8TT, (8XE), 8KK, 8XM, 8KU, 8XW, 8ZG, 8ZQ C.W., 8ZR, 8ZV, 8ZW, 9HI, 9KF, 9MC, 9ZJ, NSF.

2AVE, JAMAICA, N. Y.

1AE, 1AW, 1CK, 1CM, 1DY, 1JQ, 1OE, 1XM, 1GAX 1HAA, 1JAP, 1MAD, 1CBJ, 1GBC, 1GBT, 2's too numerous, 3At, 3BC, 3BG, 3CC, 3EN, 3EV, 3GO, 3GL, 3HJ, 3IW, 3KM, 3NB, 3OW, 3VV, 3XF, 3XM, 3ABI, 3ACT, 3ALT, 3APT, 4BY, 4FD, 8BC, 8CG, 8DP, 8DZ, 8FE, 8FQ, 8GI, 8HG, 8HR, 8HY, 8KZ, 8LF, 8LQ, 8NI, 8NZ, 8OI, 8OS, 8OZ, 8QE, 8RQ, 8SP, 8TN, 8TT 8TY, 8XE, 8XK, 8YN, 8ZD, 8ZV, 8ZW, 8ZY, 8AaZ, 8ACF, 8AKE, 8AFB, 8AGK, 8AGO, 8AIB, 8AIO, 8AMM, 8AMQ, 8AOA, 8ACT, 8APB, 8ASF, 8AUQ, 8AXC, 8AYN, 9BP, 9GP, 9LQ, 9MC, 9ME, 9OY, 9QH, 9UH, 9UK, 9UU, 9ZJ, NSF, WWV.

2KV, BRONXVILLE, N. Y.

1AW, 1BBL, 1CK, 1DY, 1GM, 1JAP, 1JQ, 1MAD, 1OE, 1QP, 1YB, 2FG, 2SZ, 3ABC, 3ACM, 3AHK, 3ALN, 3ATA, 3BG, 3CC, 3EH, 3EN, 3FG, 3GO, 3HJ, 3HX, 3IB, 3IQ, 3KM, 3NB, 3OU, 3PU, 3RW, 3TA, 3UC, 3UQ, 3XF, 3XM, 3YK, 3ZO, 4CK, 5SL, 7IM, 8AAZ, 8ABZ, 8ACF, 8ACS, 8AFG, 8AGK, 8AHG, 8AHZ, 8AIO, 8AXC, 8BC, 8BO, 8BQ, 8BZ, 8DR, 8FK, 8FQ, 8FT, 8GI, 8HG, 8HR, 8HY, 8ID, 8IN, 8JO, 8KE, 8KZ, 8ML, 8QE, 8RQ, 8SA, 8SK, 8SP, 8TT, 8WY, 8XE, 8XU, 8ZD, 8ZN, 8ZW, 9AWX, 9JQ, 9LQ, 9MC, 9ME, 9UH, 9UU, 9ZJ C.W., 1NBA, 1QR, 1XM, 1XX, 2ACT, 2AJF, 2AJT, 2AJW, 2AKO, 2AWK, 2BDU, 2BH, 2BML, 2DF, 2FD, 2FZ, 2HZ, 2PM, 2RB, 2UD, 2XAC, 2XK, 2XQ, 2XX, 2ZL, 2ZM, 3AAO, 3CC, NSF, WWV, 4GL, 8DR, 8IV, 8JM, 8XK, 8ZG.

2OM, RIDGEWOOD, N. J.

(1AE), 1AW, 1BY, (1CK), (1CY), (1CZ), 1DY, (1GM), 1GBC, (1GBS), (1HAA), (1MAD), (1MAU), 1CE, 1RAY, (1SN), (1UL), 1WQ, (1XM), (1YB), (3AAG), (3ABG), 3ACT, 3AIC, (3CV), 3FJ, 3HG, (3HJ), 3HX, 3IT, 3IW, (3KM), (3NB), 3UF) (3VV), 3XF, (3XM), 4YA, (8ACF), 8AGK, 8AIO, (8BC), 8DR, (8GX), (8ID), 8NI, (8RQ), 8SH, 8SP, 8TT, 8WL, 8XE, (8XU), 8ZW, 9AAF, 9AAW, (9AWZ), 9CP, 9DLX, 9FF, 9LQ, 9UU, 9ZJ, 9ZN, NSF, WWV.

2DK, SCARSDALE, N. Y.

1AW, 1BBL, 1CBJ, 1CK, (1CY), 1DY, 1FV, (1GBC), 1GBT, 1HAA, 1JAP, 1LAX, 1OE, 1QP, 1RAS, 1RV, 1RZ, 1UN, (1XM), 1YB, 2AIF, (2BB, fone), 2BM, 2DA, 2FG, 2SZ, 3ALX, 3CC, 3CC, 3CV, 3DR, 3EN, 33FJ, 3FR, 3GO, 3GU, 3HG, 3HJ, Daylight, (3IW), 3OU, 3PU, 3UF, 3UQ, 3XM, 3YO, 8ABZ, 8AGD, 8AJT, 8AMQ, 8ARW, 8BC, 8DC, 8DP, 8DY, 8DZ, 8EF, 8GB, 8GX, 8ML, 8MM, 8NI, 8OJ, 8PT, 8RQ, 8SP, 8TT, 8WY, 8XE, (8XU), 9AAW, (9ACJ), 9AJH, 9AWZ, 9CP, 9DLX, 9FF, 9KL.

3AGI, READING, PA., on silicon

1BBL, 1JQ, 1GBT, 1HAA, 1MAD, 1OBE, 1RAY, 1AW, 1BZ, 1CK, 1CZ, 1IA, 1JQ, 1QP, 1XB, 2BM, 2EL, 2FG, 2JU, 2OA, 2OW, 2RK, 2SZ, 2TK, 2ZM, 3AWV, 3BZ, 3EV, 3GO, 3HG, 3NB, 3VV, 3XF, 3XM, 3YK, NSF-Fone, 8AEE, 8AGK, 8AGO, 8APB, 8AXC, 8AYN, 8BC, 8BO, 8FK, 8GI, 8IL, 8KZ, 8ML, 8NI, 8QE, 8RQ, 8SP, 8VQ, 8XE, 8XU, 8YN, 8ZN, 8ZR, 8ZW, 8ZY, 9ABL, 9HJ, 9MC, 9QH, 9WE, 9ZJ, 9ZN.

3CA, ROANOKE, VIRGINIA

1AW, 1GBC, 1OE, 1TS (C.W.), 2BK, 2BML (C.W.), 2DA, 2FG, 2JJ, 2RK, 2ZL (C.W.), 2ZM (spk and C.W.), 3AAO (C.W.), 3ABC, 3AHK, 3BBE, 3CC, 3DH, 3EN, 3GO, 3HJ, 3HX, 3KN, 3OV, 3PU, 3UM, 3VV, 3XF, 3XM, 3YK, 3YU, 3ZA, 3ZJ, 4AU, 4BY, 4DY, 4EY, 4FD, 4GN, 4YA, 5DA, 5EK, 5XA, 8ABZ, 8ACF, 8AIB, 8AMR, 8ANK, 8AOV, 8ARW, 8BC, 8CE, 8CF (C.W.), 8DC, 8FT, 8JE, 8JM (C.W.), 8ML, 8OW, 8RG, 8RQ, 8RY, 8SP, 8TN, 8WY, 8XE, 8YM, 8YN, 8ZY, 9AAF, 9AEG, 9ANV, 9ATW, 9AZX, 9FS, 9LQ, 9MC, 9OI, 9PS, 9SP, 9UH, 9UK, 9US, 9YA, 9YB, 9ZB, 9ZJ, 9ZL, 9ZN.

BLACKSTONE MILITARY ACADEMY, BLACKSTONE, VA.—March

1NA, 1XX, 2NF, 2QR, 2XE, 2XX, 2YC, 3AA, 3CK, 3CY, 3DH, 3DN, 3ER, 3GO, 3GX, 3HG, 3NB, 3RG, 3PU, 3XM, 3XJ, 3YO, 4AW, 4AG, 4BA, 4BY, 4CA, 4CK, 4FD, 4YA, 4XB, 5AM, 5DA, 5ER, 5JE, 8AH, 8BV, 8FM, 8IK, 8IN, 8IV, 8JV, 8JY, 8KZ, 8OY, 8RX, 8RY, 8TM, 8WE, 8XE, 8XJ, 8XK, 8XM, 8YA, 8YR, 8ZD, 8ZG, 8ZI, 8ZJ, 8ZR, 8ZY, 8AAH, 8AGK, 8AGD, 8ARS, 8ARW, 9AF, 9AV, 9BD, 9CD, 8GJ, 9GN, 9MF, 9SX, 9TS, 9VX, 9YB, 9YD, 9YN, 9ZA, 9ZD, 9ZN.

4CK, WINSTON-SALEM, N. C.

1QP, 1GBC, 1AW, 1CK, 1MAB, 2BK, 2JN, 2BGH, 2EL, 2UA, 2DA, 2RK, 2JJ, 2DN, 2BGR, 2JU, 2ZL (C.W.), 3BP, 3XM, 3AHK, 3CC, 3FG, 3FX, (3GO), 3HJ, (3EN), 3ACT, 3AB (C.W.), 3PU, 3AN, 3FV, 3AWV, 3UG, (3VV), (3XF), 3OU, (3ACE), 3KM, 3YE, (3BZ), (3AEV), 4YA, (4XC) (4BK), (4BY), (4FD), 4AU, (4GN), 4AM, 4CP, 4GL (C.W.), 4DV, 4DT, 5XA, 5YE, 5DA, 8QE, 8ZN, 8ZL, 8AMJ, 8YK, 8ZW, 8AFB, 8LV, 8SP, 8HG, 8ADE, 8ACF, 8YN, 8LY, 8RU, 8AYN, 8ARW, 8DY, 8GX, 8AOU, (8RQ), 8WY, 8ZA, 8CF (C.W.), 8MM, (8AGD), 8NI, 8OM, 8IN, 8ZD, 8FG, 8DC, 8AEE, 8XI, (8AXC), 8XE, (8AKH), 8DI, 8AIC, 8DJ, 8ZR, 8AIE, 8GW, 8AKV, 9WE, 9FN, 9ZB, 9AAW, 9LQ, 9YC, 9LP, 9AIR, 9APS, 9FD, 9MC, 9FS, 9NJ, 9ZN, 9LF, 9AWU, 9UH.

5LO, MIAMI, OKLA, March

5YA, 5BI, 5BM, 5CL, 5EA, 5ER, 5EU, 5EW, 5FB, 5GW, (5HJ), (5HL), 5IB, 5JD, 5JM, 5JR, 5JS, 5LR, 5SL, 5XS, 5YE, (5YH), 5ZA, 5ZR, 5ZS, 5ZV, 5ZW, 5ZX, 8IK, 8ZL, 8AGD, 9AP, 9DF, 9DY, 9EL, 9EQ, 9GS, (9HI), 9IZ, 9JA, 9JG, 9JN, 9JQ, 9KF, 9LQ, 9LR, 9MS, (9OE), 900, 9PS, 9QO, 9RC, 9RR, 9SI, 9TK, 9WQ, 9WS, 9WU, 9XI, 9XM, 9YA, 9YI, 9YY, 9ZA, (9ZB), 9ZG, 9ZJ, 9ZL, 9ZR, 9ZZ, 9ACL, 9ACN, 9ACX, 9AEG, 9AEY, 9AEZ, 9AFX, (9AIZ), 9ANF, 9AOJ, 9AQE, 9ATN, 9ATO, 9AWG, 9AXU, 9HB, 9XAE fone.

5JY, DALLAS, TEX.

(5AI), 5AL, 5BM, (5CE), 5OW, 5ER, (5EW), 5ES, 5EL, 5FA, 5FB, 5FE, 5GU, (5HF), 5HL, (5HV), (5IB), (5IE), 5IF, (5IS), (5IU), (5IX), 5JA, 5JD, 5JE, (5JG), (5JL), (5JU), (5KG), (5KK), 5KQ, (5LC), 5MC, 5ME, (5MK), (5ML), (5MM), (5MR), (5NC), 5NG, (5NY), 5XA, 5XB C.W., (5XG), 5XJ, 5YE, 5YH, 5ZA, 5ZB, 5ZC, 5ZF, 5ZG, spk-fone-mod. C.W., 8ZL, 8HG, 8AKV, 8KK, 8MR, 9AAC, 9AAZ, 9AEG, 9AEQ, 9AEY, 9ACL, 9ANP, 9AWO, 9AON, 9AUO, 9CA, 9DKP, 9EL,

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9FF, 9FU, 9HI, 9HT, 9JA, 9JN, 9JQ, 9LA, 9LC, 9LW, 9MC, 9MM, 9NQ, 9OE, 9OR, 9PS, 9QO, 9UQ, 9UT, 9WN, 9WU, 9WW, 9XI C.W., 9XM C.W., 9YA, 9ZA, 9ZL, 9ZQ, 9ZY C.W.

5OD, QUINLAN, TEXAS

5AL, 5CE, (5DW), 5ER, 5EW, 5FB, (5HF), (5HV), 5IB, 5IF, 5IS, 5IU, 5IX, 5JG, 5JU, JY, 5KK, 5LC, 5MM, 5NC, 5ZA, 5ZB, 5ZC, 5ZF, 5ZG C.W., music and phone, 5ZL, 5ZS, 5XB, spk, C.W., fone. 5YH, 8HG, 8YG C.W., 8YJ, 9BW C.W., 9HI, 9JA, 9JY, 9LY, 9OE, 9OR, 9PS, 9ZC, 9ZN, 9ACN, 9AEG, 9UG, 9ALG, 9YO.

6EN, LOS ANGELES

5HL, 5IF, (5ZA), 5ZI, 5XD, (6AE), 6AF, 6AG, (6AJ), (6AK), (6AFN), (6AH), spk.-C.W., (6AV), (6AN), (6AFY), (6AAW), (6AAT), 6AFU, (6AAZ), (6BN spk.-C.W.), 6BU, (6CC), 6CE, 6CH, 6CL, (6CO), (6CO), (6CP), (6CA), 6CS, (6CV), 6CW, 6CY, (6DP), (6DY), 6ET, 6EV, (6EP), (6EX), (6FE), (6FI), (6FS), (6FM-C.W.), (6FH), 6GA, 6GK, (6GQ), (6GV), 6GO, (6GR), (6GF), (6HH), (6HO), (6IC), 6IM, 6II, (6IY-C.W.), (6IZ), 6GX, (6JI), (6JK), (6JN), (6JA), 6JO, 6JQ, (6JI), 6KL, (6KM), 6KZ, 6LD, (6MZ), (6OC), (6OW), (6OH), 6OT, 6PM, (6PR), (6PJ), (6VL), 6VS, 6VK, 6LT, 6QU, 6QM, (6QR), (6SK), (6UM), (6TC), (6TV), (6HP), (6WV), 6AID, (6AEA), (6BX-C.W.), (6BAB-C.W.), (6ZA), (6ZB), 6ZE, (6ZH), (6ZK), 6ZM, (6ZO), (6ZR), (6ZU), (6ZX), (6ZY), (6ZZ), (6XZ), (6WN), 6ADA, 7AD, 7CC, 7CW, 7CR, 7BP, 7BQ, 7GQ, 7DA, 7DK, 7EC, 7GH, 7ZI, 7ZJ, 7ZG, 7ZB, 7IN, 7IM, 7GY, 7GO, 7YA, 7YS, 9WU, 9JE, (9OE), (9PS), 9LR, 9ZN, 9ZJ, (9XM-C.W.).

6ABA, ALTADENA, CALIFORNIA, March

6BX, 6DD, 6DS, 6EF, 6EN C.W., 6EX, 6FX, 6GF, 6IC, (6IQ), 6IX, 6KL, 6KP fone 6KY, 6LLC, 6LU, 6MH, (6MW), 6ND, 6NQ, 6PO, 6QS, 6SK, 6UB, 6VH, 6VZ, 6ZH, 6ZU, 6ZX, 6AAG, 6ACR, 6ADN, 6AGF, 6AGN, (6AHA), 6AID, 6AIW, 6AKH, (6ALD), 6ALL, 6ALU, 7BQ (865 mi.), 7YA.

6ZX, ex 6EJ, WALNUT GROVE, CAL., March

(5ZA), (6AAK), (6ABP), (6ADX), (6AGF), (6AIK), 6AJX, (6DP), (6ED), (6EF), 6EN, (6ER), 6FT, (6GP), 6ID, (6IF), 6IV, 6JT, (6KP), 6KS, 6MH, (6MZ), (6LC), 6OH, (6PG), (6RN), (6SK), (6XZ), 6ZB, (6ZH), 6ZM, (6ZN), 6ZY, (6ZZ), 7AD, 7AX (7BC), (7BK), 7BP), (7BQ), (7BR), (7CU), (7CW), 7DS, 7ED, 7FI, 7FG, 7FL, (7GG), (7IN), 7JW, 7BY, (7ZI), (7GM), (7GJ), 9YW.

IRVING PINKERTON, NOGALES, ARIZ.

5BW, 5IF, 5ZA, 5ZJ, 6AC, 6CV, 6EN, 6ER, 6J1, 6MZ, 6SK, 6WV, 6XW, 6XY, 6XZ, 6ZA, 6ZH, 6ZM, 6ZR, 6ZT, 6AJH, 6AFP, 7CC, 7EX, 7JE, 7YA, 7YW, 7ZG 7ZO, 9AR, 9EE, 9KG, 9OE, 9PS, 9SQ, 9ABX, 9AEG.

7YA, BOISE, IDAHO

2RK, (5BA Can.), 5IF, (5XD), (5ZA), 6AD, (6AE), (6AH), (6AK), (6AN), (6AT), (6BJ), (6BQ), 6BW, 6BX C.W., 6CH, 6CO, (6CV), 6DD, (6DP), (6EA), (6EB), (6ED), 6EF C.W., 6EJ C.W. & Spk., (6EN), (6ER), 6EW, 6EX, 6FI, 6FS, 6GE, 6GP, 6GY, 6HK, 6IC, 6IF, 6IG, 6IS, 6IV, 6IY C.W., 6JD, 6JJ, (6JR), (6JT), (6KA), 6KH, 6KM, 6KO, 6KP, 6LC, 6LE, 6LT, (6LW), 6MK C.W., (6NQ), (6OC), (6OH), (6OT), 6OW, 6PO, (6PR), (6QR), 6QS, 6SK (6TC), (6TV), 6UV C.W., 6VL, 6VM, 6WO, (6WV C.W. & fone), 6WZ, 6XAD C.W., (6XW C.W. & fone), 6XZ, (6XA), (6ZE), 6ZE C.W., (6ZH), (6ZK), (6ZM), (6ZN), (6ZO), (6ZR), 6ZU, 6ZX, 6ZY, 6ZZ, 6ZAA, (6AAG), 6AAT, spk. & C.W., 6AAV, 6AAW, 6ABM, 6ACM, 6AEW, 6AFN, 6AGF, (6AID), (6AIW), 6AJE, 6AJH, (6AJT), 6AJX, 6AOM, (6APH), (7AD), 7BA, (7BC), (7BH), (7BJ), 7BK, (7BP), (7BQ), 7BX, (7CE), 7CN, (7CU), (7CW), (7DA), (7DS), 7ED, (7EX), 7FD, 7FI, 7FL, (7FM), 7FO, 7FQ, (7FT), (7FY), 7GA, (7GQ), 7GY), 7HF, (7HJ), 7HN, (7HU), 7IM, 7IV, 7IY, (7JD), 7JF, (7JW), 7KA, 7KM C.W., 7KX, (7LE), (7LN), (7LO), 7LS, 7LV, (7LY), 7MB, 7MY, (7NL), (7NN), (7OF), (7OT), (7OK), (7PS), 7YG, (7LS), (7ZB), (7ZG), (7ZH), (7ZI C.W.), (7ZJ), (7ZK), (7ZM), 7ZO, (7XD), 9BW, 9FG, (9EE), 9HI, (9HT), (9JN), 9KA, 9LR, (9LW), 9NR, (9OE), 9PS, 9QB, 9RG, 9WA, (9WU), 9XI C.W., 9XM C.W. & Spk., 9YI, (9YW), 9YY, 9AEG, 9AEY, 9AGN, 9ALG, 9ASF, 9AWD, 9AYU, 9XAE, 9ZAC, 9ZAB.

7BQ, PULLMAN, WASH., March

5IF, (6AE), (6AJT), (6AT), (6AAT), (6AID), (6AGF), (6DD), (6EA), (6ED), (6EJ), (6FI), (6FH), (6IC), (6JJ), (6JP), (6KA), 6MK), (6OT), 6PR, (6QR), 6ZA, (6ZR), (6ZU), (7AD), (7BH), (7BJ), (7BK), (7BP), (7BR), (7CB), (7CE), (7CN), (7CU), (7EX), (7ED), (7GA), (7GQ), (7IN), (7LU), (7NL), (7NN), (7YA), (7YS), (7ZG), (7ZJ), 9AM, 9AEY, 9AFX, (9AGN), 9ATO, 9DKS, 9CC, 9EE, 9IF, 9JN, 9LR, 9LW, 9MC, 9OE, 9RL, 9UT, (9WU), 9YO, 9YW, 9XLL, 9ZC,

8SP, FAIRMONT, W. VA.

(1AW), 1CK, (1CZ), (1DY), 1OE, (1XM), (1GBC), (1HAA), 1JAP, (1MAD), (1RAY), 2BB, 2BG, (2DA), 2DN, 2DR, (2EL), (2JU), (2OA), 2OM, (2OO), (2RM), (2RK), (2UA), (2UK), 2VA, 2ZL, 2ZN, 2AID, 2GBL, (3BZ), (3CC), (3EN), 3FG, (3GO), (3HG), (3HJ), 3HX, 3IW, (3KM), (3NB), 3NC, 3OU, (3PU), (3QF), (3UC), (3UQ), (3VV), (3XF), (3XM), 3ZA, 3ZL, (3ACT), (3AHK), 3AWV, (4AG), (4CK), (4YA), (4YK), 5ER, (5XA), (8BC), (8BO), 8CF, (8DI), 8DJ, 8DR, 8FI, (8FK), 8FQ, 8FT, (8GI), (8GB), 8HG, 8HY, (8HR), (8ID), (8IN), 8IV, 8JJ, 8JM, 8LV, 8ML, (8MM), (8MT), (8OI), 8PX, (8QE), (8RQ), 8SH, (8WR), (8WY), 8ACF, 8ACY, (8ADE), (8AEE), (8AFB), (8AGD), (8AGK), 8AGO, (8AIB), 8AIO, (8AJT), 8AKJ, (8AKV), (8AMM), 8AND, (8ANT), 8ARS, 8AVF, 8AWA, 8AWP, (8AYF), (8XE), 8XM, 8XU, (8YN), (8ZA), 8ZD, 8ZN, 8ZW, (8ZY), (9AP), 9ET, (9FS), (9GP), (9HR), 9KF, 9KO, 9LF, (9LQ), (9MC), 9OE, (9OX), 9QH, (9UH), (9UK), (9UU), (9WE), 9ZJ, (9ZN), 9AAF, (9AAW), 9ABJ, 9ABL, 9AEG, 9AGH, 9ANV, 9AWG, (9AWX), WL3, XF1, NSF, Canadian (3BP) 3DH.

8ANA, DETROIT, MICHIGAN

1AW, 1XA, 2AWL, 2DN, 2EL, 2FG, 2GO, 2RK, 2UR, 3CC, 3EFX, 3EL, 3EN, 3GO, 3HG, 3NB, 3PU, 3XM, 3ZF, 4FD, 4XC, 8ADG, 8AFS, 8AGK, 8AGO, 8AGW, 8AIO, 8AMW, 8AOG, 8ASP, 8AXC, 8BC, 8BK, 8BDU, 8DG, 8DI, 8FA, 8GI, 8GO, 8HG, 8HI, 8HP, 8HR, 8HY, 8IL, 8IN, 8IRS, 8JN, 8KA, 8KO, 8LD, 8LV, 8MM, 8NC, 8RL, 8RQ, 8RT, 8ST, 8TN, 8XC, 8XE, 8XU, 8ZD, 8ZI, 9AAW, 9ACN, 9AEO, 9AJ, 9DR, 9ANV, 9AP, 9AV, 9AXU, 9CA, 9EL, 9EQ, 9FG, 9GO, 9GL, 9HN, 9JA, 9JN, 9JY, 9KO, 9LL, 9LQ, 9NJ, 9NR, 9NW, 9OE, 9PS, 9QH, 9QN, 9QO, 9SP, 9TW, 9UH, 9UU, 9WW, 9WI, 9XI, 9ZC, 9ZJ, 9ZK, 9ZN.

8AOY, LANCASTER, N. Y.

1AW, 1CK 1CY, 1CZ, 1DY, 1GAV, 1GBC, 1HAA, 1MAD, 1OE, 1QS, 1TS, 2AR, 2BB, 2BM, 2CT, 2EL, 2JJ, 2JU, 2KM, 2OM, 2RK, 2VA, 2UK, 2XQ, 2ZL, 2ZM, 3AB, 3AAE, 3ACT, 3ALN, 3CC, 3DS, 3HJ, 3IW, 3KM, 3MO, 3NB, 3PU, 3SC, 3VA, 3XM, 3YE, 3YK, 3ZA, 5XA, 8AAX, 8ADQ, 8ADR, 8AGK, 8AHS, 8AHQ, 8AJR, 8AMB, 8AMJ, 8AMZ, 8ANS, 8ANJ, 8ANT, 8AOF, 8APJ, 8ARS, 8AVE, 8AXC, 8AXQ, 8AYE, 8AYN, 8BC, 8BV, 8CF, 8CG, 8CZ, 8DR, 8FE, 8GI, 8HF, 8HR, 8IL, 8IN, 8KR, 8KU, 8KW, 8KZ, 8LA, 8LB, 8MF, 8MH, 8MZ, 8NU, 8NZ, 8OI, 8PJ, 8QB, 8RQ, 8SP, 8TN, 8UF, 8XE, 8XK, 8XU, 8YG, 8ZA, 8ZD, 8ZL, 8ZN, 8ZR, 8ZW, 8ZY, 9AAW, 9AMK, 9FG, 9FS, 9HJ, 9IP, 9KF, 9LQ, 9UF, 9UU, 9XM, 9YB, 8ZB, 9ZC, 9ZJ, 9ZN, 9ZT, 9ZU, NSF, XF1.

8AXC, MARIETTA OHIO

1AW, 1BZ, 1CZ, 1DR C.W., 1OE, 1QR C.W., 1JAP, 1MAD, 1RAS, (1GBC), 1XM I.C.W., 2BK, 2DA, 2EL, 2FG, 2JJ, (2QE), 2OW, (2RK), (2SZ), 2UK, 2VA, 2AWL, 2BGH, (2BML C.W.), 2XQ Spk. & fone, I.C.W., 2ZL C.W. I.C.W., 3BZ, 3CC Spk & C.W., 3EN, (3FM), (3GO), 3HJ, 3IW, (3KM), (3NB), 3OU, (3PU), (3QF), (3VV), 3AAE C.W., 3AAG, (3ABC), 3ACM, (3ACT), 3AHK, (3ALN), (3WV), 3XA, (3XF), 3XI fone, (3XM), 3XN, 3YK,

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8ZL, 3ZN, 3ZP, 3ZZ, 4AG, 4AU, 4BK, 4BY, (4CK), (4CX), 4DT, 4FD, (4XC), 4YA, 4YB, 5CC, 5DA, 5JD, 5XA, 5YH, 5ZL, 5ZAB, 5ZAC, 8AL, (8BC), 8BO C.W., 8BQ, (8OJ), 8DP, 8DR, 8DZ, (8EF), 8FE, 8FG, 8FI, (8FT), (8GI), 8GS, 8GX, 8HA C.W., 8HG, (8HR), 8IB C.W., 8ID, 8IK, (8IN) 8JE, 8JU C.W., (8KK), 8KZ, 8MI, 8ML, (8MM), 8MT, (8MZ), 8NZ, 8OI, 8OJ, 8PU, 9PW, 8QU, 8RE, (8RQ), (8SP), 8TJ, (8TY), 8WY, 8AAZ, 8ACF, 8ACY, 8ADE, 8AEE, 8AFB, (8AFD), 8AFO, (8AGD), 8AGK, 8AGO, 8AKH, 8AMM, 8AMW, 8AMZ, 8ANJ, 8ANK, 8AOA, 8AOP, 8AQV, 8ARD, 8ARS, (8AVD), 8AVF, 8XE, 8XK I.C.W., 8YG C.W., (8YN), 8ZA, 8ZD, 8ZN, 8ZR, 8ZV, 8ZW, 8ZX, 8ZY, 9AP, (9AR), 9BP, 9CP, 9FS, (9FU), 9GN, 9GP, 9HM, 9HR, 9JA, 9JN, 9JQ, 9KF, 9KL, 9LQ, 9MC, 9ME, 9NQ, 9NW, 9OE, 9QH, 9QR, 9JV, 9UH, 9UK, 9UU, 9AAC, 9AAG, (9AAW), 9ABL, 9ACN, 9AEG, 9AEY, 9AGH, 9ALG, 9ALS, 9AMK, 9ANV, 9ANV, 9AWW, 9AWX, 9ASL, 9DLX, 9YB, 9ZB Spk. & C.W., 9ZJ, 9ZN, KDKA fone, (NIFX), (NSF fone), WWV.

8LF, CRAFTON, PA.—All C.W.

1AE, (1TS), 1XF, 1XK, 1XM, (2AJF), 2BML, 2ZL, 2ZM, 3AAE, (3AAO), 3BM, (3CC), (3WS), 3XM, 4AAE, 4XB, 8BO, 8DP, 8IB, (8IV), 8KM, 8OZ, 8QY, 8VS, 8YG, 8YZ, (8ZG), 9AJA, 9LC, 9XI, 9XM, 9YA, 9ZB.

8ZA, NEW PHILADELPHIA, OHIO

(1AW), (1BZ), 1BBL, 1CK, 1MAD, 1HAA, 1XM C.W., (2BML C.W. & fone), 2CC, 2DN, 2BGH, 2EL, (2FG), 2JU, 2RK Spk. & C.W., 2SZ, 2VA, 2XQ fone, 2ZL C.W., (2ZM C.W.), 3AAO C.W., 3ACM, 3ALN, (3AHK), 3BZ, 3CC C.W., 3EH, (3EN), 3AWW, (3GO), 33HG, 3HJ, 3HX, 3KM, 3KO, (3NB), 3MME C.W., 3OU, 3PU, 3XF, (3XM), 3YK, 3YV, 4AG, 4AL, 4AU, 4CK, 4XB C.D., 5DA, 5HL, 5YE, 5YH, 8AL, 8AAY, 8AAV, 8ABZ, (8ACF), 8AEE, 8ACY, 8AFD, (8AGD), (8AGK), (8AGO), 8AHR, 8AKH, 8ALY C.W., (8ANJ, 8AMF C.W., 8ANT, 8AOA, 8AQV, 8ARK, 8ARW, 8AXC, 8BC, 8BCO, 8BK, 8BQ, 8BO, 8CD, 8CH, 8CP, 8DC, (8DJ), 8DR, 8DV, 9FA, 8FQ, 8FE, 9FK, 8FI, 8FT, 8GE, (8GH), 8GI, (8GW), 8HA, 8HG, 8HR, 8HS, 8IB C.W., 8ID, 8IN, 8JL, 8JM C.W., (8JU C.W. & fone (8KM C.W. & fone), 8KP, 8LF C.W., (8LQ), 8LV, 8LW, 8ML, (8MM), 8NI C.W., 8NZ, (8OI), (8OP), 8OM, 8OW, 8OZ C.W., 8PE, 8PN, 8PU, 8QM, 8QY C.W., 8RQ, 8RW, 8SH, 8SP, 8TN, 8TT, 8UR, 8VS C.W., 8WY, 8WZ, (8XE), 8XK, 8XU, 8YG C.W., 8YN, 8YV, 8ZD, 8ZG C.W., 8ZL, (8ZN), 8ZP, (8ZR), 8ZT, (8ZV), 8ZW, (8ZX), 8ZY, 9AAV, (9AAW), 9ACJ, (9AP), (9AWX), 9AWV, 9AXJ, 9AMC, 9AMV, 9ABL, 9ANV, 9AV, 9CC, 9DV, 9EQ, 9ET, 9EZ, (9FG), 9FN, (9FS), 9DLX, (9GP), 9HJ, (9HN), (9HR), (9KF), 9IL, (9LQ), 9JA, 9JQ, (9JT), 9LW, 9MC, 9MS, 9NQ, (9PC), 9PV, 9QO, (9UU), 9QH, 9XI, 9XM, 8XAE, 9YAC, 9YAD, (9ZC), 9ZJ, (9ZN), (9ZV), (NSF), (NIF) XF1, XK1.

9NQ, GALESBURG, ILL., Every District.

1AW, 1XM mod C.W., 2RK Spk. & mod C.W., 2ZM, 8CC, 3EN, (3GO), 3NB, 3QF, 3XM, 3YK, 4AG, 4BY, 4XB, 4XC, (5EK), (5HL), 5IB, 5NK, 5XA, 5XB (5YH), (5ZA), (5ZL), 5ZU, 5ZAA, 5ZAB, (6WV), 6ZZ, 7EX, 7YA, 7ZM, 7ZO, (8AL), 8CF mod C.W., (8ID), (8MM), 8ZN, 8ZY, 8ACF, 8ACY, (8ADE), 8ASM C.W., 8BBO, (9AR), (9CP), (9EL), (9HM), (9KO), (9LC), (9LQ), (9LW), (9OE), (9PV), (9TI), (9UU), (9XI), 9XM Spk. C.W., mode & fone., 9YM, (9YAD), 9ZB C.W., 9ZJ, 9ZN, (9ZT), (9ZV), 9ZY C.W., 9ZAC, NSF, WWV.

9AIF, SIOUX FALLS, S. D.

2RK I.C.W., 5EU, 5HL, 5HV, 5IF, 5JD, 5YH, 5XB C.W. & Spk., 5ZA C.W. & Spk., 5ZE, 5ZL, 5ZR, 5ZU, 7YA, (7ZG), (7ZO), (8AFS), 8AIB, 8KP, 8LF C.W., 8LQ, 8PJ C.W., 8QJ, 8QY I.C.W., 8XK fone & I.C.W., 8YN, 8ZR, 8ZW, [illegible]Y, 9AAC, 9AAW, 9ACB, 9ACN, 9AEG, 9AEH, 9AEN, 9AEY, (9AGN), 9AIZ, 9ALG, 9ALK, 9ALS, 9AMX, 9ANF, 9ANP, 9ANQ, 9ANV, 9AOH, 9AOK, 9AON, 9AOU, 9ARP, 9ASF, 9ATN, 9ATO, 9AUO, 9AUU, 9AWX, (9AYW), (9DAT), 9DIW, 9DJI, 9DJX, 9DKT, 9DLX, 9NRK, 9AP, 9BQ, 9CA, 9CP, (9DE), 9DO, 9DV, 9EE, (9EI), 9EL, 9EQ, 9FG, 9FU, 9GP, 9HI, 9HN, 9HR, 9IY, 9JA, 9JN, 9JQ, 9KF, 9KL, 9LF, 9LQ, (9LW), 9MC, 9MS, 9NQ, 9OA, 9OE, 9OO, 9PL, 9PN, 9PS, 9QO, 9RG, 9SC, 9SZ, (9TI), 9TW, 9TZ IC.W., 9UF, 9UK, 9UU, 9VE, 9WI, 9XAE, 9XI C.W. & Spk., 9XM C.W. & fone, (9YAE), 9YAF, 9YB, 9YO, 9YT, 9YW, 9ZAC, 9ZB, C.W. & Spk., 9ZC, 9ZJ, 9ZU, 9ZY C.W., 9ZV.

9FS, GOSHEN, IND.

1AW, 1JA, 1XM C.W., 2EL, 2RK, 2SZ, 2ZL, (3AAO C.W.), (3AHK), (3CC), 3DH, 3DS, 3EN, 3GO, 3KM, (3XF), 3XM, 3YK, 4AG, 4CG, 4GL (5XA), 5XB, 5YE, (5YH), 5ZD, 5ZT, 5ZL, 5ZW, 5ZX, 9ACF, (8AFB), 8AFS, 8AGD, (8AXC), 8CD, (8CP), (8DZ Spk. C.W.), (8FI) (8HG), 8HR, 8IN, 8JE, 8JL, 8JN, (8MM), (8NZ), (8OM), (8PN), (8PU), (8RQ), (8SP), (8TK), (8TN), (8YN), (8ZA), 8ZD, (8ZY), (8ZL), (8ZN), (8ZR), 8ZV, 8ZW, 9AAG, (9AAW), 9ABC, 9AEG, 9AFX, (9AGH), (9AGN), 9AGX, (9AKC), (9AKH), 9AKZ, (9ANV), (9AON), 9ARG, 9AXU, (9AZX C.W.), (9DAX), (9DLX), (9DKT), 9YAC, 9YAD, 9ZAC, (9DV), 9FJ, 9FN, (9FQ), 9GP, 9GX, 9HM, (9JL), 9JN, 9KF, 9LC, (9LQ), (9LW), (9ME), 9NQ, 9BP C.W., (9PC), 9ZJ, 9PS, (9UK), 9WE, (9WO), (9WZ), (9VZ), 9QH, (9QO), (9TO), 9XI C.W., 9XM C.W. Spk and fone, 9YA, (9YB), (9YC), (9YM), (9YQ), (9ZC), (9ZN).

9AE, BOONE, IA., C.W.. Stations.

2ZL, 2ZM, 5XB, 5ZA, 8ALY, 8AMZ, 8IK, 8JM, 8OH, 8VS, 8XK, 8XY, 8YG, 8ZL, 8ZN, 8ZG, 8ZR, 8ZW, 8ZY, 9AG, 9AK, 9AL, 9AMU, 9LC, 9RQ, 9XI, 9XM, 8ZB, 8ZC, 9ZY, 9AZX, NMW, NSF, XF1.

9ACJ, CHICAGO

1HAA, (2CS), 2DK, (2DN), (2RK Spk. & I.C.W. Can 3BP, 3CC, 3GO, 3HG, (3HJ), 3KM, 8NB, (3XF), 3XM, 4AG, 4FD, 4XC, 4YA, (5HL), 5IF, (5YH), 5XA, 5ZA, (5ZAB), 5ZL, 5ZX, 6KA, 7ZG, 8ACF, (8ACY), (8ADE), 8AEE, 8AFS, (8AGK), (9AGO), 8AIB, (8AKV), 8AXC, (8AL), 8BBW, 8BO, 8BI, 8CD, (8EB), 8EF, 8FK, (8FQ), 8GX, (8HG), (8ID), (8IN), 8JE, (8JL), 8ML, 8MM, 8NL, 8OI, (8OJ), (8RQ), (8RU), 8SP, 8TN, (8TY), 8WY, 8XE, 8XK C.W. & fone, 8ZL, 8ZN, (8ZW), 8ZY, (9AAC), (9ABI), 9ACB, 9AEG, 9AEY, 9AKA, 9ALG, 9ALO, 9ANK, (9ANP), (9AOH), 9AOJ, (9ARG), 9ARJ, 9ATO, 9AXU, (9AYE), 9DV, (9EE), 9EK, 9EL, 9EZ, (9FU), 9HK, (9HN), 9HT, 9IY, 9JA, (9JL), (9JN), 9JQ, (9KO), 9LQ, (9MS), (9NQ), 9OE, (9OO), 9PS, 9QO, (9TI), 9UH, 9UG, 9UT, 9WE, (9XI), 9ZAC, 9ZB, 9ZT, (CW3).

9AHC, ELLENDALE, N. DAK.

5CE, 5EK, 5HK, 5HL, 5HV, 5IB, 5IF, 5JI, 5JR, 5LB 5LC 5MM, 5NK, 5YH, 5ZA, 5ZB, 6LC, 6WV, I.C.W., 6ZA, 6ZH, 6ZZ, 7DH, 7EX, 7HS, 7IM, 7LU, 7LY, 7MO, 7ZG, 7ZM, 7ZO, 8BO, 8BP, 8CF I.C.W. C.W., 8FT, 8ML, 8JM C.W., 8OZ C.W., 8SP, 8XK C.W., 8ZR, 8ZY, 8AEE, 8AGK, 8AIO, 8ANW, 8AOU, 8AXC C.W., 9AAV, 9ABH, 9ACD, 9ACJ, 9ACL, 9AGN, 9AEG, 9AEJ, 9AEY, 9AFK, 9AFX, 9AG C.W., 9AGN, 9AHF, 9AHO, 9AHZ, 9AIF, 9AIS, 9AJH, 9AJP C.W., 9AKA, 9AKC, 9AKM, 9AKX, 9ALG, 9ALH, 9ALK, 9ALO, 9ALU, 9AMH, 9AMK, 9AMV, 9ANF, 9ANP, 9ANV, 9AOA, 9AOH, 9AOJ, 9AOK, 9AON, 9AOU, 9AP, 9AQA, 9AR, 9ARJ, 9ARP, 9ARS, 9ASF, 9ASL, 9ASN, 9ATG, 9ATN, 9ATO, 9ATV, 9AUH, 9AUO, 9AUS, 9AUU, 9AV, 9AVP, 9AWX, 9AWZ, 9AXU, 9AYE, 9AYS, 9AYW, 9BM, 9BP, 9BQ, 9CP, 9DAE, 9DAT, 9DBO, 9DD, 9DE, 9DIW, 9DJX, 9DKS, 9DLS, 9DLX, 9DMB, 9DML, 9DNN, 9DO, 9DV, 9EK, 9EL, 9EQ, 9EW, 9FF, 9FS, 9FX, 9GC, 9GP, 9HI, 9HM, 9HT, 9IF, 9II, 9IY, 9JA, 9JE C.W., 9JN, 9JQ, 9JV, 9KD, 9KL, 9KO, 9LF, 9LQ, 9LW, 9MC, 9ME, 9MS, 9NQ, 9NR, 9NW, 9OA, 9OE, 9OO, 9PC, 9PI, 9PL, 9PN, 9PS, 9QH, 9QO, 9RY, 9SZ, 9TI, 9TO, 9TW, 9UF, 9UG, 9UH, 9UK, 9UU, 9VB, 9VC, 9VE, 9WE, 9WI, 9WO, 9WS, 9XAE, 9XI, 9YAC, 9ZAA, 9ZAC, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZY C.W., NSF.

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April Station Reports

1NAQ, Hartford, Conn.

Steadiest	Loudest
1HAA—1RAY—1MBS	1RAY—1HAA—1MBS
2RK—2BML—2ZL	2RK—2EL—2ZL
3XM—3GO—3KM	3XM—3ABC—3GO
—— —— ——	4FD—4AL ——
8RQ—8BC—8ZR	8KP—8BC—8RQ
9ZJ—9ZL—9ZN	9ZJ—9ZL—9ZN

1DY, Lynn, Mass.

Steadiest	Loudest
1HAA—1SBZ—1YB	1HAA—1YB—1MAD
2EL—2RK—2JU	2EL—2RK—2JJ
3XM—3NB—3GO	3XM—3NB—3HX
8SP—8XE—8ZA	8XE—8DR—8BC

1CK, Braintree, Mass.

Steadiest	Loudest
1OE—1HAA—1SBZ	1SBZ—1HAA—1OE
2RK—22EL—2JU	2RK—2EL—2OM
3XM—3CC—3GO	3XM—3CC—3GO
None consistent	4YA—4EY—4CK
8XE—8XU—8BC	8XE—8XU—8VQ
9ZJ—9LQ—9ZN	9ZJ—9ZN—9LQ

4XC, Atlanta, Ga.

Steadiest	Loudest
—— —— 1AW	—— —— 1AW
2RK—2EL—2BK	2EL—2RK—2BK
3GO—3HJ—3NB	3GO—3HJ—3NB
4GN—4FD—4BY	4GN—4BY—4FD
5XA—5YH—4ZAB	5YH—5XA—5YE
8ID—8DC—8RQ	8DC—8AXC—8HG
8ZY—8ZW—8XE	8XE—8ZW—8ZR
9MC—9LQ—9UU	9OX—9EL—9MC
9ZJ—9XM—9YI	9YI—9XM—9ZJ

4AM, De Land, Fla.

Steadiest	Loudest
2RK—2JU—2EL	—— 2RK—2JU
—— 3BZ—3GO	3BZ—3GO—3EN
4DL—4XC—4FD	4DL—4XC—4YA
—— 5XA—5YA	5XA—5YA—5ER
—— —— 8SP	8HG—8XE—8SP
—— 9ZJ—9MC	—— 9ZJ—9MC

5XA, Auburn, Ala.

Steadiest	Loudest
1XB—1XF—1AW	1XB—1UBC—1RW
2RK—2ZL—2EL	2RK—2EN—2EL
3GO—3BZ—3IW	3GO—3EN—3HG
4BY—4YB—4YA	4BY—4GL—4YA
5ZAB—5YH—5HL	5HL—5HV—5ZL
8ZL—8KP—8RQ	9XK—9TN—9RQ
9AAC—9ZN—9FU	9ZN—9YC—9CA

5ZL, Little Rock, Ark.

Steadiest	Loudest
2RK—2ZL—2PL	2RK—2ZL—2PL
3GO—3AAG—3DH	3GO—3AAG—3DH
4XC—4YA—4AG	4YA—4XC—4AG
5HV—5EW—5NK	5HV—5EW—5NK
6WV —— ——	6WV —— ——
8MR—8ZY—8BA	8ZY—8MR—8BA
9AEG—9ZAC—9OE	9OE—9ZV—9AEG

8SP, Fairmont, W. Va.

Steadiest	Loudest
1MAD—1AW—1DY	1MAD—1AW—1DY
2EL—2RK—2JU	2JU—2EL—2RK
3XF—3CC—3EN	3XF—3XM—3NB
4CP—4YK—4YA	4YK—4YA—4CP
5ER—5XA	5ER—5XA
8AXC—8AGK—8RQ	8OI—8YN—8AGK
9LQ—9UU—9MC	9LQ—9MC—9ZN

8ZA, New Philadelphia, O.

Steadiest	Loudest
1BBL—1AW—1HAA	1AW—1RAY—1BBL
(C.W.) 1XM—1RZ	(C.W.) 1XM—1RZ
2ZM—2RK—2SZ	2RK—2SZ—2DN
2ZM—2ZL—2BML	2RK—2BML—2ZM
(C.W.)	(C.W.)
3XM—3GO—3XF	3XM—3GO—3EN
3AOA—3CC—3MME	3AOA—3CC—3MME
(C.W.)	(C.W.)
4AG—4XC—4AU	4XC—4AG—4AU
(C.W.) 4XB only	(C.W.) 4XB only
5YE—5YH—5DA	5YH—5DA—5YE
8ANJ—8AGK—8ZW	8BO—8LV—8ZW
8ZV—8JU—8KM	8ZV—8ZG—8LF
(C.W.)	(C.W.)
9UU—9ZN—9LQ	9JT—9ZN—9PC
(C.W.) 9XI only	(C.W.) 9XI only

9ME, Ft. Wayne, Ind.

Steadiest	Loudest
1AW—1BBL	1BBL—1AW
2RK—2EL	2RK—2EL
3XM—3EN—3AWV	3XM—3EN—3AWV
4AG—4BK	4AG—4BK—4XM
5ZAB—5JD—5DA	5ZAB—5JD—5DA
8ZY—8DX—8ZL	8ZY—8DX—8ZL

9FS, Goshen, Ind.

Steadiest	Loudest
1AW—1HAA—1XM	1XM—1AW—1HAA
2ZL—2RK—2SZ	2ZL—2RK—2SZ
3DH—3EN—3AHK	3EN—3GO—3DH
4XC—4AG	4XC—4AG
5XA—5YH—5YE	5YE—5XA—5ZL
8ZA—8XE—8RQ	8ZR—8XE—8RQ
9ZN—9AEG—9ZN	9EQ—9HN—9ZN

9YB, Purdue University, Lafayette, Ind.

Steadiest	Loudest
—— —— ——	1AW —— ——
—— —— ——	2RK —— ——
3XM—3EN—3KM	3XM—3EN—3YK
4GN —— ——	4XC—4AU—4GN
5YH—5XA—5DA	5DA—5YH—5XA
8XE—8ZR—8ZA	8XE—8DI—8ZA
9ZJ—9LQ—9OE	9ZJ—9QO—9OE

Remarks:

First District. 1AW comes in well at times on fading tests but not heard often otherwise.

Second District. Usual lack of good signals from Second District.

Third District. 3XM, following in the footsteps of 3DH, has been best although gap used lately changes tone and does not come through so well. 3EN seems to be going well.

Fourth District. Not much doing; few stations heard occasionally.

Fifth District. No change except that 5XA is coming through more often.

Sixth and Seventh District. No stations heard.

Eighth District. Based on steadiness of signals and the number of times heard 8XE takes the lead this month with 8ZR next and 8ZA following. 8DI comes in very loud at times.

Ninth District. 9ZL still holding the lead, 9LQ next best, although 9QO and 9OE come in more loudly at times.

SUMMER ARRIVES.

(*Continued from page 29*)

force. Make schedules with the fellows you hear and watch how the gang grows. Summer operation in the early morning is so incomparably better than at night that we would be wise to change our bed-time hour so we could join Mr. Hebert's "Early Birds" of bygone years. As announced elsewhere in this issue, we're going to have a contest, right in the middle of summer with all its static, and see who can do the best receiving. Reading thru QRN is an art in itself but with only a little practice musical tone signals can be read as long as

(*Concluded on page 58*)

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Central Illinois Get-Together

The Central Illinois Amateur Banquet will be held in Peoria at the Jefferson Hotel in June. This meeting will not be a Convention but will be a regular get-together and ham-fest with a banquet in the evening. This affair will be held under the auspices of the Peoria Radio Club and it is hoped that a good attendance of Illinois men will be present.

New Club Papers

QST is in receipt of copies of several new club organs, among which are "The Hamville Star", published by the Central Michigan Wireless Assn., of Lansing; "The Radio Digest", of the Springfield (Mass.) Radio Assn.; and "The Radio Radiator", published by the Jefferson City (Mo.) Radio Club; all affiliated with the A.R.R.L.

As we have said before, we think the idea of local sheets is a fine one, and every amateur will find that the pleasure of having a home radio paper makes it worth his most enthusiastic support.

M. V. R. A.

The Monongahela Valley Radio Association with headquarters at Fairmont, W. Va., has recently affiliated with the A.R.R.L. Its present officers are:

President: A. G. Heck, 8EF
Vice-Pres.: Edw. C. Jones, Jr., 8JE
Sec'y-Treas.: Albert G. Kisner, 8SP

The membership is now about twenty, composed of station-owners within forty miles of Fairmont, although mostly confined to Marion County. The membership include several former Signal Corps men, and other eligible amateurs are expected to join.

One purpose of the organization is to combat the QRM evil, which is not only from local spark coils, but from hams on high power poorly tuned sets in a city 25 miles away, who use full power to work a few city blocks, and have no regard for hours, QSS tests or other amateurs.

The meetings of the M.V.R.A. are not limited to the usual gab, but often experiments are made. Recently, in order to tell how much the human element enters into making the QSS charts, artificial fading was made with a buzzer and a loose coupler, with every member's phones connected in. Results showed that everyone interpreted the general characteristics the same.

Lectures on practical and theoretical subjects are regular features. Meetings are held semi-monthly.

An inter-city checker tournament is being arranged, and will take place as soon as the champions can be located at hours that will cause the least interference.

All communications to the club should be addressed to Edward C. Jones, Jr., 8JE, 522 Fairmont Ave., Fairmont, W. Va.

Northwestern Radio Assn.

The Northwestern Radio Association of Portland, Oregon, has recently purchased a General Radio wavemeter to be used in tuning the members' stations. The meter was found to be unsuitable for use in tuning a transmitter to 200 meters, so is being rebuilt for this purpose.

The orgnization is growing rapidly, and now includes over sixty active members from several counties in two states. Meetings are held every Friday night at 8 P.M. in the Journal Bldg., Portland. It has been found advisable to devote certain meetings each month exclusively to discussions on radio subjects, all business being set aside. This has met with marked approval.

Lowell's Radio Dance

Another successful radio exhibit and dancing party was held on March 29th by the Lowell (Mass.) Radio Club, with a huge attendance. The music was transmitted by radio from the club rooms to the dance floor at Associate Hall. In addition to the dancing another novelty was presented in the form of a miniature railroad system completely controlled by wireless.

Columbus Radio Club

Columbus, Ohio, has a live radio club of about 65 members. On April 1st the club held its annual election of officers, resulting in the choice for president of M. Fay McDowell, A.R.R.L. City Manager; vice pres., John Martin; secretary, F. S. Harmer, 74 N. Monroe Ave., and treasurer, Leo Hirsch.

The club recently entertained the convention of Ohio amateurs as mentioned in

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last QST. A club room is being sought atop a high office building, where it is planned to maintain a good DX relay station.

Dallas Radio Club

Citizen radio in the vicinity of Dallas is booming, and is showing its value to the community.

The Dallas Daily Times Herald recently had a full page story of the achievements of the local men, illustrated with photographs of the operators and equipment of stations 5ZC, 5ML, 5ZG, and the club's able secretary, Brother Porter T. Bennett. This article has done much to open the eyes of the general public to the fact that we amateurs are more than a bunch of kids.

The big news from Dallas, however, is the story of the reporting of recent municipal elections by radio, in co-operation with the Dallas Dispatch. Election returns were phoned by the Dispatch to Ben Emerson, 5ZG, who broadcasted them by radiophone, and were picked up at a half dozen points over the city where the club members had installed temporary sets equipped with Magnavoxes. Large crowds in auditoriums and before bulletin boards, as well as hundreds in outlying districts, were accordingly kept instantly posted on the progress of the count. The new mayor's first message to his people was likewise sent out by radiophone and was conveyed to a dozen large gatherings, two-score private radio parties, and the election watchers in downtown streets.

Dallas now has a time schedule calling for free air 8 a.m. to 7 p.m., with blanks for time signals and daylite QRK tests; 7 to 7:30 p.m. reserved for broadcasts; 7:30 to 8:30 p.m. free air but no testing; 8:30 to 9:30 p.m. short relays and collection of local traffic; 9:30 p.m. to 8 a.m. long distance relaying.

Phila. A. R. A.

The Philadelphia Amateur Radio Assn. announces a contest for the best reception accomplished with loops, closing Sept. 19th, with suitable prizes for the winers. Particulars can be obtained from the president, J. E. Delp, Jr., 1526 No. Hollywood St.

During the past month some very interesting and valuable papers were presented before the association. Meetings are held on the first and third Monday nights of each month and all amateurs of the Third District are cordially invited to attend and partake in the discussions.

West Allis Radio Club

The West Allis (Wisc.) Radio Club was organized about May 1st, 1920, and after going thru some rather strenuous times became a recognized organization in West Allis. The club now numbers 20 members and is steadily on the increase. Just recently the club joined the Milwaukee Radio Executive Council to co-operate with the other clubs in Milwaukee County in the reduction of QRM which hinders traffic.

Address all communications to West Allis Radio Club, 602 64th Ave., West Allis, Wisc.

Lehigh Valley Radio Association

A very enthusiastic meeting of the wireless men in Bethlehem, Allentown, Easton, and vicinity was held March 10th, at Bethlehem, Pa. This was the largest and most interesting meeting of wireless men ever held in this vicinity. Mr. F. Clifford Estey, President of the Essex County (Mass.) Radio Association, gave a talk on club organization and the experiences of his recent trip throughout the west and south in the interest of wireless.

After Mr. Estey's talk a business meeting was held at which it was voted to form a new association to be known as the Lehigh Valley Radio Association, with a section or club in each of the cities and towns in the valley, all running as separate clubs yet bonded together in the larger association and meeting in one of the cities once each month and the separate sections holding meetings once each week or as often as desirable. Each section will elect its own officers and the president of each section will be a vice president of the Lehigh Valley Radio Association. Besides these vice presidents the association will have a president and chairman of the Advisory Board and these officers will be the governing body of the entire association.

Mr. K. F. Gray of Easton was elected president of the Association and Mr. Arthur F. Breisch of Bethlehem was chosen chairman of the Advisory Board. A committee of three was appointed by the president from each city to call the wireless men together in their towns and conduct the local elections.

TUBES WITHOUT FILAMENTS

(*Concluded from page 26*)

to the thickness of a sheet of paper and enclosed in a cylindrical glass tube containing Neon or Helium gas. The field of a powerful permanent magnet is directed across the gaseous space between the two electrodes and apparently causes the liberation of electrons thru ionization due to atomic bombardment. Just how the action is controlled to produce oscillations we do not know and chief interest in the Amrad company is now centering on the use of the new device as a rectifier.

Tubes without filaments would certainly be a blessing and we will await developments with interest.

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Radio Communications by the Amateurs



The Publishers of QST assume no responsibility for statements made herein by correspondents.

GENIUS, OR THE P.O.D. RADIO ENGINEERS

Omaha, Nebr.

Editor, QST—

Since the beginning of time man has been bothered with genius. Some geniuses do something and others undo something. This is a story of geniuses that undid something. Just how they accomplished this undoing is narrated below.

As is the case with every burg, city or village, Omaha has its representative body of radio men. If you think I'm kidding just mooch the phones off the the operator at 9HT some evening about eight o'clock. Here you will find Genius in the form of mother's little lambkins permeating the air with ungodly squeaks and groans. But I'm getting slightly off the subject for it's a higher type of genius I wish to tell about, the type who wishes to place before the eyes of the layman, Wireless; Wireless in the form of some mysterious super-natural phenomena.

Coming from lunch Thursday noon, March 10th last, Mr. E. M. Ruede, chief engineer for the Nebraska Power Co., met Mr. Fred Swain of the C & S Radio-Electric Co. of Omaha. Mr. Swain, clothed in a pair of overalls and ready for radio work of any kind, asked Ruede just how to get on top of the power company building.

"We're planning a little radiophone demonstration from the Auto Show in the Auditorium to the Fontenelle Hotel", explained Swain.

"What are you going to use, a telephone line or a Victrola?" asked the interested Mr. Ruede.

Swain promptly found the top of the building and Ruede returned to his work.

Monday noon saw Ruede and some of his friends inspecting a newly stretched P.O.D. on the top of the building and, funny, but that darned P.O.D. ran the six blocks from the auditorium to the Fontenelle and jumped five trolley lines to do it. Gosh but wireless means a lot of work, doesn't it? Tuesday afternoon leads were run from the P.O.D. to a back room in the power company building and when a telephone receiver was shunted around these leads the darned diaphram just naturally jingled and stuck tighter than ever.

And in the lobby of the Hotel Fontenelle sat a brand new coupe. Above this coupe ran a small flat top aerial while out of the hotel balcony ran a lampcord lead straight into the car. The contents of that car were doubtful. Was that some new fangled coffee grinder setting in the back seat or was it really one of the famous short wave regenerative receivers? At any rate two Magnavox horns adorned the top of this bus and that surely was all that was necessary, for from one of those wonderful horns spouted forth sweet, beautiful music, "wireless music from the municipal auditorium". Oh, what a wonderful age to live in—wireless music from the Auto Show six blocks away!

Wednesday morning a reporter from the Omaha World Herald traced the P.O.D. line for his own satisfaction and then with a sore neck adorned a chair in the lobby of the Fontenelle. He couldn't sleep so he gave the "Wireless Auto" the once over. What was all the funny noise coming from that crazy horn? Sounded like the tuning of some musical instrument combined with the scraping of feet and the low murmur of voices. Mr. Reporter lines out for the power company and hunts up Mr. Ruede.

"Say there, fella, that darned horn up at the hotel's gone crazy" he explained.

"They're playing now," remarked Ruede, as he shunted a phone receiver and a condenser across his leads running from the P.O.D.

"Listen," pleaded Ruede, "you and I know this darn wireless business is a fake, but you shove over to the Herald and dig up another reporter and let him go over to the auditorium and yell into the transmitter over there and I'll bet you a quart of white mule to a quarter kilowatt power tube we'll hear him accompanying that two by four orchestra that's busy festering up a reputation for those two wizards. You sure got to give it to that guy when it comes to concocting a scheme like this. And another thing,—tell the reporter you send over to snoop around ham-like and cut their lead-in to that mistake of an aerial they've hoisted on the roof of the auditorium for a decoy. In the meantime, I'm going to connect up a phone magneto to this P.O.D. and about five minutes after your reporter makes his debut I'll kick one of those Magnavoxes off the top of the

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coupe in the hotel or know the reason why. Now mozey along, Oswald, and let's climax this deal. No wonder that ham with the three tube set not three blocks from their aerial isn't hearing a peep out of them. They've got this P.O.D. loaded to the limit."

A news reporter of the Omaha World Herald walked briskly into the auditorium and yelled into the transmitter of the radiophone: "Hello Pat, do you get me? The next number will be 'Bright Eyes', played by Oleson's Orchestra?"

Having yelled into the transmitter as ordered and having accomplished his mission of separating that lead-in from its better half he made tracks for the hotel to find the music in full swing. Say gang, that's what I call efficiency,—a busted lead-in and sigs as loud as ever. Any one wishing to accomplish the same will please write the C & S Radio-Electric Company of Omaha. It's the chance of a lifetime fellows, grab it.

Forty minutes after the pot was opened every Omaha paper was represented in the form of a storm of reporters but the Herald had the dope, Ruede has accomplished his mission and the fight was over. But wait,—next day we had a come back something like this:

"The first two days we used real wireless but our bulbs all blew out at once and we had to resort to the P.O.D. It would take a long time to get new bulbs (they run a radio company) and we had to see it through."

That's about all, gang, but there's just one thing more,—that comeback was a wonderful show of genius in itself, fellows, for they seemed to know those bulbs were all going to "blow" out together. Why, say, they stretched that P.O.D. a week ahead of time!

Yours truly,
An Outraged Amateur.

Newspaper Clippings Re Above

"If Old Broadbrim could have peeped over the top of a downtown office building last night he would have looked upon his favorite dessert. Wiretappers were at work! Using a condenser in series with a telephone receiver, the whole clamped onto a wire with clips, E. M. Ruede, Kenneth Ross and a newspaper man heard over it sweet music coming from the Auditorium.

"Ruede and his friends are interested in radio work, and they have been particularly interested in the demonstration of Wilbur R. Cramer and Fred W. Swain of Omaha who, according to the Literary Digest, can catch wireless phone messages on apparatus which they have attached to their automobile.

"This week being auto week, guests at the Fontenelle have been marvelling at an auto in the lobby equipped with the young men's apparatus, for over it they maintain that music from the auditorium is transported by ether to the Fontenelle where it is caught and released by the wireless phone to those who care to hear.

"Last night visitors at the auto show were surprised, so were members of the band, when a young fellow marched up on the stage and called into the apparatus "Hello Pat, do you get me?", then went away. The wiretappers on the roof nearby hear him call also, and heard the band play.....

"In leaving the auditorium the young man who had called into the receiving apparatus accidentally shut the door on the aerial of the wireless apparatus. But, according to another secret agent the music still wafted from the wireless phone on the auto in the Hotel Fontenelle.

" 'It's a blooming fake', cried Ruede, 'I think too much of the work to let anybody put a raw one like that across; that is why we tapped this wire to find out.'

"Ruede yesterday traced a loosely and newly hung wire from the auditorium north over the rooftops to the Rialto theater, thence west to a fire escape at the rear of the Fontenelle, where the wire went in thru a window. Last night the wire-tappers not only listened to the music that they tapped from the Auditorium but they called up several of their friends and by telephone let them hear it too."

—*From the Evening World-Herald, Omaha, March* 17th.

"Wilbur Cramer, of Cramer & Swain, who have been giving auto show music by "wireless" at the Fontenelle, admitted today that their apparatus at the hotel is connected by wire with the Auditorium as charged by E. M. Ruede, who Wednesday night "tapped" their wire.

"But they really can transmit the music without the aid of wires and did so the first two days, they said. 'Two of the bulbs on our transmitting instrument at the Auditorium burned out Tuesday night', Cramer said. 'We sent to New York for others to replace them, so to keep the music going we connected the phone up by wire. Up to Tuesday night the music heard at the Fontenelle had been coming as claimed, by wireless..... It was unfortunate that our bulbs, each of which cost $7.50, should blow out at once. It looks like someone, jealous of us or something, has tampered with them under the orchestra pit at the Auditorium. Someone surely cut the ground wire of the aerial, as it was not broken by having the door slammed on it. That wouldn't break it', Swain said.

" 'Mr. Ruede went just a little too far in his insinuations', both young men de-

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clared. 'If our bulbs come in time we will yet prove to him and everyone else the music was wireless up to Tuesday night.'"

—*From the Evening World-Herald, Omaha, March 18th.*

(Of late we have had numerous complaints against the C & S Radio Electric Co. They make no response to our efforts to secure satisfactory treatment for A.R.R.L. members. We cannot recommend them to our readers.—Editor.)

IS SCOTLAND HEARING US?

130 Second Ave.,
Long Branch, N. J.

Editor, QST—

Several weeks ago I wrote to Mr. Miller of Aberdeen, Scotland (the man who says he heard 2QR), asking if it would be possible for him to listen for me, as I have a C.W. and get 2 amps. on about 240 meters. Well, the other day I received an answer and will give you a copy of part of it here:

"It must seem strange to you that I have only received 2QR and no other station, but as a matter of fact I've heard a large number of telephone and telegraph stations, but as I've got no directory of the addresses of the senders I can't write them and let them know. So I'm very glad to have had your letter. On looking over the list of the call letters of the ones I've taken, I find I've heard you and the one you work to (2AHL). You were quite strong and clear and when you said you had a low tone I quite clearly remembered you."

Now I'm going to write him and ask for a list of the calls he's heard and will shoot 'em to you as soon as I get an answer.

Hoping this may be of interest to QST readers, I remain,

Yours sincerely,
Harry J. McCollum, 2AXB.

(We also wrote Mr. Miller on April 8th and offered to swap him a new government call book for a list of the American stations he has heard, but to date we have no reply.—Ed.)

THE OLD UNANSWERED QUESTION

Stroh, Ind.

Editor, QST—

What is a ground lead? Where does it leave off and the actual ground begin?

For instance, supposing I have my transmitter located 20 feet above ground, and use a 25 foot lead to the ground. This 25 feet would be counted the same as that much lead on my aerial lead-in when I apply for a license. However, if I am using the well for a ground, my lead is only measured from my set to the well pipe. Why not simply extend a piece of 2 inch well pipe 20 feet above ground and then make my ground lead short? You will probably say that this will not do, as the pipe is the same as the ground lead.

Granting that such is the case, then please explain to me how these fellows located on high buildings, with an aerial over a hundred feet above the ground, can simply place their transmitter close to the city water pipes and have a short ground lead—ON THE THIRD OR FOURTH FLOOR ABOVE GROUND?

Please explain to me how such stations keep their wave below 500 or 600 meters, when they use an aerial 50 or 60 feet long and are perhaps 100 feet above ground. If the ground lead oscillates the same as the aerial, it would seem to me that they would have a very long wave.

Being unable to get a satisfactory explanation I turn to you.

Yours truly,
F. B. Hanes.

FROM THE BUREAU OF STANDARDS

DEPARTMENT OF COMMERCE
Bureau of Standards
Washington

May 12, 1921.

Mr. H. P. Maxim, Pres.,
American Radio Relay League,
Hartford, Conn.

Subject: Co-operative Fading Tests.

Dear Sir:

1. The series of fading tests, extending over the past year conducted by the American Radio Relay League in co-operation with this Bureau, have been highly satisfactory. We believe that no such extensive and fruitful co-operative radio transmission tests have previously been held. The possibilities of such co-operative research for the future are very great. There is no question that there might be great extensions of similar work in the future. The A.R.R.L. is admirably adapted, through its form of organization and the facilities of its membership, for further very valuable work of this kind.

2. We desire to convey through you our appreciation of the organization of the tests by your National and District officers, of the excellent work done by the transmitting and recording operators, and, in addition, the fine spirit of co-operation shown by hundreds of stations that stood by patiently during the running of the tests. There has already been partial publication of results of the tests, and we expect to prepare a full account of the work, which will be submitted for publication in "QST".

3. The next project which we should like to take up with the A.R.R.L. is the study of direction of strays. We hope to transmit to you before many days some results of our preliminary experiments.

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We appreciate that this project is probably one which will not be suitable for a very wide circle of the A.R.R.L. membership. The International Union of Scientific Radio Telegraphy is, however, making plans for co-operative radio experiments upon a large scale, and we are confident that other opportunities will arise for important contributions by the A.R.R.L.

Respectfully,

E. B. Rosa,
Acting Director.

OUR MOTTO: WE NEVER SLEEP

181 Waverly Place,
New York City,

Editor, QST—

Just noticed in the May number that I am a regular member of the Boiled Owl Club. I wish to nominate my side partner Mr. Intemann of 2ACX as another member, as he fully deserves that distinction.

On a recent nite abt a week ago we both stuck out the Saturday nite gang as per the O.M. and it sure was great sport art—every hour or so a new bunch got on and the rest went to bed. The sun came up and we still hrd 1XM, 8AIO, and others QSA. We stuck till abt 8 a.m. and then called it a nite and then went upstairs and ate abt a pint of ice cream. You see 2ACX is connected with the ice cream biz.

I wish to recommend a pint or two of ice cream to fellow B.O.'s after an all nite session of outsticking those whose stomachs never go bk on them, as it is very effective in obliterating that taste like a blacksmith's apron. If the ice cream alone is insufficient I wud advise a few pickles and bananas sliced in with it.

Well, on with the good wk, boys. QRU nw cul best 73s de

A. Rechert, 2TT, opr. 2ACX.

A SPLENDID IDEA

324 Tinkler Street,
La Fayette, Indiana.

Mon Cher Eddy:

When I reached my room yesterday afternoon I found "QST" waiting for me, so I devoured it in big chunks and let the rest of the world go by. I was particularly interested in 9ZN's article on the "Ideal Spark Transmitter". After having devoured about half of the number, I went over to a friend's station and tried to receive through all the static in the world. (The only thing from out of town that I got all evening was 9XM signing off on straight CW, QSA but still difficult to copy through the QRN.)

Having thus passed (up) an evening I went to bed. Suddenly a brilliant idea came to me. (It might be well to explain that I am a short-connection-fiend.) Why not cut about an inch out of the one-turn primary (of 1-16" x 2" copper,) and arrange your rotary, of the straight-through type, so that it shall have electrodes of 1-16" x 2" aluminum? In other words, why have leads at all from your condenser to your gap and from your gap to your O.T.? Of course, the cut ends of the primary would be supported on efficient insulators and ground to a thin edge. I think that this must be the limit, so far, in means for the conservation of the amateur's invaluable, priceless inductance—and might be the means of bringing some of the wave-length-law-breakers down to 199⅞ meters in stead of 400.

Truly yours, OM,
Wm. E. K. Middleton,
Canadian 4AQ.

WE STAND CORRECTED

15 Roseland Ave.,
Waterbury, Conn.

Editor, QST—

Permit me to call your attention to an error occuring in "Strays" of the April issue of QST.

The editor says, "You radiate energy which is measured in watts." This is not correct. Watts are a measure of *power* which is the *rate* at which energy is used. In order to obtain the energy the watts must therefore be multiplied by a time factor. For instance if energy is put into the primary of a transformer at a *rate* of 1 kilowatt and the transformer is operated for 2 hours there is used 1 x 2 *kilowatt* hours of energy.

The watt is not an electrical term entirely. In the so called C.G.S. (centimeter gram, second) system of measurement it is also the unit of power and represents the delivery of one C.G.S. unit of energy per second.

A clear understanding of the difference between power and energy will help a great deal in the understanding of our various sending and receiving problems.

For instance some of Mr. Wests' "whys" in his answer to Mr. Stones' communication become much easier to answer.

Donald O. Friend.

THE A.R.R.L. SPIRIT

Princeton, N. J.
April 16.

Editor, QST—

I am inclosing two dollars as my quota for the April A.R.R.L. Drive. My work keeps me from seeking new subscribers for our little magazine, but I owe it to the A.R.R.L. to help any time I can. Hence the cash. Put it to good use, with the best wishes of

An Amateur.

(Thanks heartily, O.M. But please give us your name so we can extend your own membership a year.—Editor.)

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HERE IS A REAL IDEA!

1500 So. Ridgeway Ave.,
Chicago.

Dear Eddy:

After seeing Mr. Vermilya's letter in the March QST I decided to try it out but had too much trouble winding inductances so happened to think of another and better scheme. I brought every ground lead, insulated, up to the O.T. and tuned with ammeter for most radiation *on each ground*, all to the same wave length. Then I put them all on at once on their respective places and Oh Boy! the radiation jumped just as if u stuck it across your "A" battery. One good thing abt this idea is that the long ground leads could be used and they added to radiation but of course less O.T. was required on long ones than on the short ones.

Wl om nil nw, 73 cul.

9AOX.

WE MUSTABEEN WRONG

April 16th, 1921.

Dear Eddy:—

I am speaking at you in-re yours of April 1st., via QST, dictated by one Julius G. Aceves, by order of Dr. M. I. Pupin, I regret to advise that I do not agree with Julius.

Having had considerable experience with Bridges I feel qualified to hand you a cue.

Now Julius says that "if F is not known, a standard L_o is substituted—", while I contend that if F is not known standard Loco is not substituted, for as the Bridge may be down, an Erie Loco will do, in which case the capacity will be about 2QTS (homebrewed). On the other hand, if the power factory is closed, more than 70% of the Henrys will be in use, by which token one will know that the vacuum can be determined only by the formula,

$$\frac{\text{PHOTO-OTA2PLpg" QST 4-1921}}{2\ I^{s}} = \text{MUD}$$

Moral: Don't sit on the table, use the Bridge.

Your for Beer & Light Wines,
Inocram.

I/me

CALLS HEARD

(*Concluded from page 49*)

WUBC, CAMP KNOX, KY., All C.W.

1DT, 1HB, 2XB, 2XX, 2CC, 2XK, 2DH, 2HTS?, 2AR, 2ZL, 3AC, 3AA, 3AB Canadian, 4AI, (4XB), 5XB, 5XA, 5VS, 8XB, 8XK, 8ZB, 8VS, 8OY, 8IB, 8IV, 8ZY, 8ZW, 8PJ, 8JM, 8OZ, (8AGZ), (8KM), (8ZG), (8YG), (8ZV), (9XI), (9XM), 9BY, 9YY, 9YK, 9YG?, 9ZN, XF1, XB1, VF1, WL2, NSF.

CLIFFORD J. GOETTE

(*Concluded from page 43*)

can border. To his surprise he found that about ninety percent of the M.I.B. men were amateurs, many of whom he had heard or worked before the war, which only proves once more what a factor we "hams" were in the war. Six months after the signing of the armistice he was discharged and was one of the first to open up after Uncle Sam lifted the ban on amateur operation, and from that day on he has done his share in burning up the air.

2JU was recently described in QST and it will be recalled has a "coffin" transformer and a Grebe synchronous gap. Goette is known for his very excellent fist and his courteous and diplomatic manner on the air, qualities all the more needful because of the range of his booming spark.

Recently Goette was chosen by Division Manager Chas. H. Stewart to become his assistant in charge of the Northern Section of the Atlantic Division, and under his management new life has been put into amateur affairs in that locality. The Northern Section is one of our most important territories, since it embraces New York City and all the traffic lanes leading into that center; it abounds with good stations and good operators; and with Mr. Goette as its able leader we expect to see it speedily gain that place in A.R.R.L. affairs which rightfully should be its own.

S. KRUSE

(*Concluded from page 43*)

hung up a 1320 mile record on a half kilowatt.

Kruse helped form the Lawrence Radio Club and the Central Radio Assn. ("From the Rockies to the Ohio"—Remember it, you old-time Valley men?), and from Kansas U. went to the Western Electric engineering department at New York on circuit analysis work and the development of sub-chaser radiophones. Whence, to the Bureau of Standards Radio Laboratory at Washington, where he is now an assistant engineer. To the Bureau he carried a keen appreciation of practical operating conditions on short waves that has stood him in good stead and makes him a connecting link between the amateur world and the activities of the Bureau relating to short wave radio. He was one of the originators of the idea of the B.S.-A.R.R.L. cooperative fading tests and to him is largely due the credit for the successful inauguration and performance of the tests. The collating and analyzing of the data gathered has been and is in his hands, and when the results from this vast effort are achieved, as they surely will be, the job will have been Kruse's, and to him belongs the credit.

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At the convention in Philadelphia in March when the Third District Amateur Radio Council was organized, Kruse was elected president and there are very few men who could have been so wisely chosen. He was also recently elected a Director of our A.R.R.L.

With a sound technical training Kruse combines a hard-headed practical amateur's knowledge of practical operation, a noodle chock full of vital truths regarding 200 meters and thereabouts, and a gift for conveying ideas in a clear and clean-cut style all his own, and besides all this he can write funny stories. All of which makes him a good fellow to know.

SUMMER ARRIVES

(*Concluded from page 50*)

they are one-quarter the audibility of the strays. So it's far from hopeless! This contest, too, will show how the spark and the C.W. compare in "static-puncturing"—we think we'd like to put it: "will show just how much better a static-puncturer the C.W. is than the spark."

Another thing, men: we mustn't forget our advertisers. They have to get results from their advertising or they can't afford to continue it, and that's the only thing that keeps QST going, for the printer alone gets more than you pay for your copy. We want to suggest that summer is a good time to do your over-hauling, assemble the results of the past winter s work into panels, build up new stuff for next winter, etc. You'll get prompter shipments at this time of the year and you'll have the knowledge that you're helping the game along by boosting business thru the hot months. One thing more: whatever you do, *don't forget to mention QST when writing advertisers.* It helps you and us—we both know why.

Now for that hash-house.

Mr. Manufacturer. Mr. Amateur

Stop ! Look ! Read !

Made Right and let's settle *Stay Tight*

YOUR BINDING POST TROUBLES

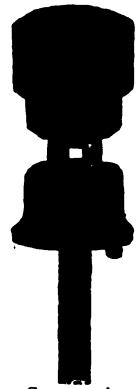


The accompanying cuts illustrate two sizes of our Current Posts and the medium size of our slotted style Potential Posts.

The bases of our Current Posts are tapped to take a #6, 8 or 10-32 machine screw and are knurled to prevent turning.

The non-removable insulated cap and base of the Potential Post is made from a high grade indestructible material.

We can supply the current post in any finish desired but unless otherwise ordered they will be furnished in a plain brass finsh.



Corporal

NINE REASONS WHY THESE UNIQUE POSTS SHOULD APPEAL TO YOU:



1—There are no parts to become lost
2—They will not mar the finest of wires.
3—They are built for a 24-hour service.
4—They are easily mounted on standard equipment.
5—They permit a smaller sized post to be used.
6—Extreme vibration will not loosen their lock grip.
7—They are surprisingly low in price.
8—They harmonize with other moving parts.
9—THEIR PARALLEL CONTACT SURFACES EXTEND THE FULL WIDTH OF THE POST.

Sergeant

Commander Opened

IMPORTANT NOTICE TO DEALERS: Here is a real money making proposition for you. We want responsible dealers in every city to carry these unique posts. The boys like them and will soon demand them on all their sets. Put your order in today. They are selling fast.

IMPORTANT NOTICE TO AMATEURS: If you want a real Binding Post that you can easily mount on your set—one that DON'T come apart and will easily clamp your wires—Demand "THE LEADER." Specify it in your next set or go to any leading radio dealer and ask for them. Do NOT order from us. Your dealer can supply them if you insist.

PAMPHLETS DESCRIBING THESE UNIQUE POSTS SENT UPON REQUEST

THE H. H. EBY MANUFACTURING CO.

1302 WALLACE STREET, PHILADELPHIA, PA.

"EVERYTHING IN RADIO"

WESTERN RADIO ELECTRIC COMPANY

SEND FOR OUR MARCH

STOCK BULLETIN AND PRICE LIST

550 South Flower Street, Los Angeles, Cal.

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QST

A MAGAZINE DEVOTED EXCLUSIVELY TO THE WIRELESS AMATEUR



JULY 1921

20 CENTS

H.A. HICK

OFFICIAL ORGAN OF THE AMERICAN RADIO RELAY LEAGUE, INC.

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For Your Information

We are pleased to reproduce the Radio Corporation's

"CHARACTERISTICS OF RADIOTRONS (VACUUM TUBES) FOR DETECTION, AMPLIFICATION AND POWER WORK"

	Detector	Amplifier	Power Tube	Power Tube	Power Tube
Price	UV-200 $5.00	UV-201 $6.50	UV-202 $8.00	UV-203 $30.00	UV-204 $110.00
Dimensions (overall)	1¾" x 4 5/16"	1¾" x 4 5/16"	2⅛" x 5"	2" x 7½"	5" x 14½"
Base	4 Prong Standard	4 Prong Standard	4 Prong Standard	4 Prong Special	Special Mounting
Voltage of Filament Source	6V.	6V.	10V.	12V.	15V.
Filament Terminal Voltage	5 to 5.4V.	5 to 5.4V.	7.5V.	10V.	12V.
Filament Current	1.1 amp.	1. amp.	2.35 amp.	6.5 amp.	15 amp.
Plate Voltage	15 to 22.5V.	40 to 100V.	350V. normal	1000V. normal	2000V. normal
Plate Current			.045 amp.	.15 amp	.25 amp.
Output Impedance	10,000 ohms	21,000 ohms at 40 Volts 14,000 ohms at 100 volts	5000 ohms		
Amplification Constant	7	8	8	10	25
Watts Output			5 normal	50 normal	250 normal

Clip this page out and save it for future reference.

THIS NEW APPARATUS WILL INTEREST YOU

As promised last month, we are the first to offer the Radio Corporation's new apparatus for experimental use. Place your order now, with Atlantic. Both our stores have a complete stock of this new equipment and will fill your orders promptly.

Radiotron U.V. 200, a gas-content detector, specially designed for amateur use $5.00

Radiotron U.V. 201, an exceptional "Pliotron" type amplifier 6.50

Radiotron U.V. 202, a 5 watt transmitter for C.W. work 8.00

Radiotron U.V. 203, a 50 watt transmitter for high powered C.W. work.. 30.00

Radiotron U.V. 204, a 250 watt transmitter for experimental C.W. 110.00

R. C. Standard Rheostat, Model P.R. 535, for Radiotron 201, 202, and 203 3.00

R. C. Standard "A" Battery Potentiometer, Model P.R. 536, for receiving 2.00

R. C. Standard Rheostat, Model P.T. 537, for Radiotron 203 and 204.... 10.00

20 Watt Kenetron Rectifier Valve, Model U.V. 216 7.50

150 Watt Kenetron Rectifier Valve, Model U.V. 217 26.50

R. C. Standard porcelain socket Model U.R. 542, for Radiotron 200, 201 and 202 1.00

R. C. Standard Bakelite socket, for Radiotron 200, 201 and 202 1.50

R. C. Special Bakelite socket for Radiotron U.V. 203 4.25

R. C. Standard porcelain socket Model U.T. 541, for Radiotron U.V. 203 2.50

R. C. Standard end mountings for Radiotron U.V. 204, per pair 2.00
(Model U.T. 501 for filament end, Model U.T. 504 for plate end.)

R. C. Inter-tube tone frequency amplifying transformer, Model U.V. 712, for Radiotrons 200 and 201 7.00

R. C. Standard grid leak, mounting and unit 1.25

R. C. Standard grid leak, mounting 50

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QST

The Official Organ of the A.R.R.L.

VOLUME IV JULY, 1921 No 12

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QST

A Magazine Devoted Exclusively to the Radio Amateur

Modulation in Radio Telephony

By R. A. Heising*

Presented at Radio Club of America, Columbia University, Feb. 25, 1921.

In Two Parts: Part I.

Here at last is really authoritative information for the amateur on radiophones. Mr. Heising has given the amateurs a splendid paper couched in terms they can understand and we consider it the best article on the subject it has yet been our pleasure to present. Incidentally it should settle once and for all the argument about grid leak vs. constant current modulation.—Editor.

The Modulated Antenna Current

The average radio amateur on entering the radio telephone field, must bear in mind the fact that he has much to learn to make a satisfactory telephone set that was not necessary for a telegraph set. Also, that because the nature of the signals to be transmitted is different, certain methods of operation and certain requirements which were proper for telegraphy are decidedly improper for telephony. Neglect of these facts and a blind effort to apply to telephony the rules for telegraphy will result in a considerably poorer set than should be the case.

Before discussing any of the systems of modulation, it appears desirable to point out some of the essential facts concerning radio telephony. By doing so, the reason for many modulation circuit connections will be better understood and the finer points which distinguish a poor arrangement from a good one will be appreciated. A study of the form of the antenna current as influenced by a signal will give us many pointers as to the best arrangements for a good circuit.

Human speech, which is the signal to be transmitted in radio telephony, consists of an aggregation of frequencies lying largely between 200 and 2000 cycles per second, having various amplitudes, periods of duration, and transients at the beginning and end, so arranged as to convey information to the listener. To convey the human voice by radio it is necessary to provide a system which will convey all of these frequencies; that is, it must reproduce each frequency at the receiving end and reproduce it with the proper amplitude in comparison with the others, and reproduce its "transient" or amplitude variation at the beginning and the end, and it must do this for each frequency while doing it for others. This is enormously more difficult than transmitting a telegraph signal. To transmit a telegraph signal it is only necessary to produce some kind of a noise at the receiving station and the signalling is done by varying the duration of this noise. The noise does not have to bear any relation to any noises at the transmitting station but needs only to be something the receiving operator can hear. In telephony, *any* noise will not do, because the noise to be reproduced must be identical with the noise produced at the transmitting station, it must contain the same frequencies, give them their relative amplitudes, and have them last the proper length of time. The complexity of the signal necessitates a control of the radiated wave not necessary in a telegraph system and it is the control which is such an important part of the radio telephone circuit.

An example of a radio telephone wave is indicated in Figure 1. The carrier wave amplitude is here varied according to the wave form of the signal. The precision of control required to cause the proper antenna current, regardless of the millions of forms the signal may take, is quite evident. This signal on being received and rectified

* Engineer Research Laboratories of American Telephone & Telegraph Co. and Western Electric Co., Inc.

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will reproduce the modulating signal, since the rectified current will be substantially proportional to the high frequency amplitude.

In the discussion of a radio frequency current, it is usual to assume a simple signal as the modulating signal, as most of the necessary information can be secured with that assumption. It is assumed that the signal to be transmitted is a single sine wave of some audio frequency such as 800

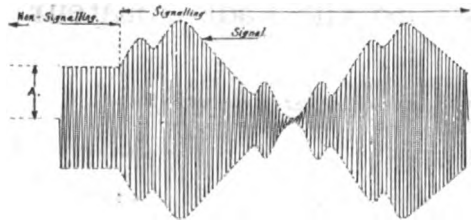


FIG 1 H.F Wave Modulated by a Speech Signal

cycles. A modulated antenna current carrying this signal is represented in Figure 2. This antenna current is expressed by the equation

$$i = A\ (1 + K \sin p\ t) \sin wt \quad (1)$$

In this equation *sin wt* represents the radio frequency wave and *sin pt* the signal frequency wave. *K* is known as the modulation constant and is usually expressed in percentage form. When no signal is being transmitted the high frequency amplitude is *A* and the constant *K* is zero. If a signal of such a loudness as to make K equal to unity is spoken, the term $1 + k \sin p\ t$ varies between values of 0 and 2 depending upon $\sin p\ t$ passing through the values -1 *and* $+1$ and the amplitude of the high frequency current varies between zero and *2A*. That is, the modulation of the current causes it to rise, as well as fall, and it should rise as much above as it falls below. If the system is so constructed that the amplitude does not rise, but is varied downward only, a speech signal will produce a wave of the form shown in Figure 3. In-

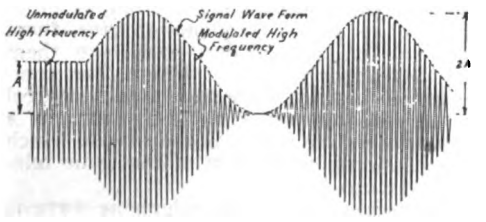


FIG 2 H.F Wave Modulated by a Single Sine Wave Signal

spection of this indicates that a great distortion is produced. The amplitude should vary so as to follow the dotted signal line, but the failure of the system to cause the current amplitude to rise chops off one-half of the speech signal and gives an imperfect reproduction at the receiving end. This one-sided or improper modulation is to be avoided if possible.

Those who are acquainted with elements of trigonometry will observe that we can change the form of the equation (1). Such a change does not affect its validity at all but does point out one or two new facts. The equation can be changed to:

$$i = A \sin w\ t - \frac{AK}{2} \cos\ (w + p)\ t + \frac{AK}{2} \cos\ (w - p)\ t \quad (2)$$

This equation indicates that a sustained wave, such as shown in Figure 2 and represented by equations (1) and (2), can be said to consist of three frequencies—

The radio carrier frequency $\frac{w}{2\pi}$ *of amplitude A*

An upper side frequency $\frac{w + p}{2\pi}$ *of amplitude* $\frac{KA}{2}$

And a lower side frequency $\frac{w - p}{2\pi}$ *of amplitude* $\frac{KA}{2}$

When no signal is being transmitted, $K = 0$ and the only frequency is the radio carrier frequency with amplitude *A*. As soon as the signal begins to modulate the wave, the side frequencies $\frac{w + p}{2\pi}$ and $\frac{w - p}{2\pi}$ of amplitude $\frac{KA}{2}$ appear while the carrier remains unchanged. The modulation of the radio wave thus takes the form of the production of side frequencies. At the receiving station, the beats between the carrier frequency and the side frequencies, when rectified, produce the frequency of the transmitted signal.

If the signal to be transmitted consists of many frequencies such as 200, 500, 1200, and 2000 cycles, the frequencies in the antenna will be the carrier frequency *f* and the side frequencies $f+200$, $f-200$, $f+500$, $f-500$, $f+1200$, etc. In telephony, human speech contains frequencies largely between 200 and 2000 cycles so that to transmit speech by radio we must expect to have in the antenna the carrier *f* and the side frequencies $f+$(200 to 2000) and $f-$(200 to 2000). That is, if we use a carrier of 50,000 cycles there will occur in the antenna the frequencies—

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The carrier 50,000 cycles
Lower side frequencies between 48,000 and 49,800
Upper side frequencies between 50,200 and 52,000
giving us *a band 4,000 cycles wide necessary for the transmission of speech.*

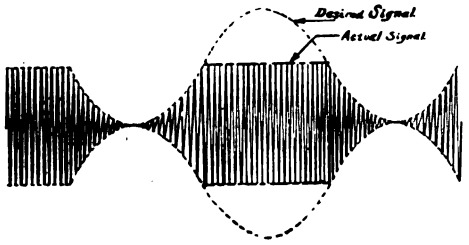


FIG. 3 An improperly Modulated Wave

Having described in detail the important features of a radio telephone wave, we are now in a position to point out a few facts of vital interest to an amateur. In radio telegraphy, it is customary to tune and adjust the set for the maximum antenna current that it is possible to obtain. Signalling is then done by making and breaking the circuit causing the antenna current to fall to zero in the spaces and rise to the maximum in the dots and dashes. The greater the antenna current, the greater is the VARIATION in the current when signalling. The VARIATION in the current is what is desired and the maximum antenna current is tuned for only because the change in current between that value and zero gives the greatest VARIATION. The VARIATION in the current while signalling is thus the factor which determines the loudness of the received signal. In telephony the VARIATION in the antenna current while signalling is also the determining factor as regards loudness of signal or distance to be reached, but the amateur must remember that the determination of the maximum VARIATION is not so easily done as in the case of telegraphy. The antenna current is not merely reduced to zero in spaces and then returned to the normal value, but it varies through all possible values from zero to TWICE THE NON-SIGNALLING VALUE. In telegraphy the current is either zero or maximum. In telephony it has a certain non-signalling value (*A* in equation 1 and Figure 2) and takes all possible values between 0 and twice the non-signalling value (*2A* in equation 1) and the apparatus must be capable of producing any possible value between these limits. Therefore the amateur is warned that when he tunes his set up for the non-signalling value *A*, he must see that the system that he uses has some variable in it which when operated upon by the speech will make the set give *2A* in the antenna. Failure to remember this will result in producing one-sided modulation as shown in Figure 3.

In telegraphy, it is possible to determine with the antenna ammeter alone the VARIATION in antenna current while signalling. When the key is open the current is zero, when it is closed the current is a maximum. In telephony, unfortunately for the amateur, there is no simple apparatus to tell what the variation is, or to tell him when he is getting complete modulation. There are, however, two indicators which will give an operator some idea of his degree of modulation. The first is the variation in the reading of the antenna ammeter. When a wave is completely modulated by a symmetrical signal in a properly adjusted set, the antenna ammeter reading increases by about 22½%. (To be exact, the reading is $\sqrt{(1.5)}$ times the non-signalling value). This must not be taken as an infallible guide as it is not easy to get a set adjusted so as to make this indicator worth much. A badly distorted wave will give a reading variation of even greater than this amount. Judgment should not be passed upon this evidence alone. The second indicator is the quality of the received signal. The signal from a set which tends to "over-modulate" has a peculiar sound often described as "tinny". It sounds like the voice of a person holding a sheet of paper against the lips. It is caused by the over-modulating action

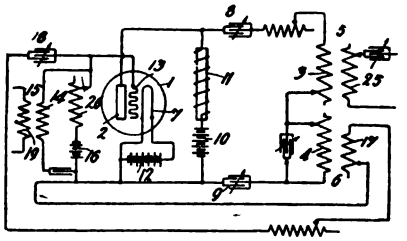


FIG 4 Colpitts System

cutting off the peaks of certain loud signal waves. The identification of this kind of distortion can be learned by observation. The amateur must not let his imagination get the better of him and confuse microphone distortion or other noises and distortions with this over-modulation distortion as many do. He should learn to identify the sound under conditions that will not give him the wrong impression of its character. This indicator is the only cheap indicator of complete modulation at present available to the amateur. It is much more reliable than the antenna ammeter method,

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but indicates only over-modulation. It will be found, however, to be useful.

Having discussed the nature of a modulated antenna current, we are now in position to discuss some of the systems which produce it.

Colpitts System

Among the systems of modulation which may be of interest may be mentioned Colpitts' system shown in Figure 4 and a modification of it, the Logwood system shown in Figure 5. This system is

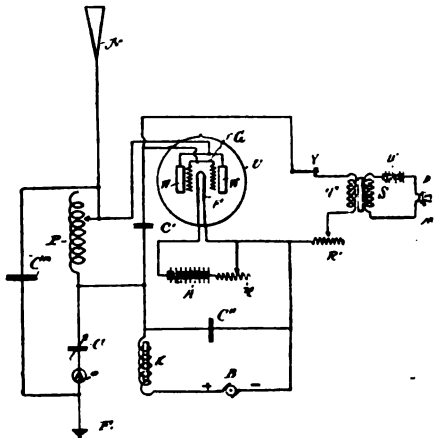


FIG 5 Logwood's Circuit

primarily an oscillator upon the grid of which the speech signal is impressed. In this circuit the grid acts as control member for the amplitude of the oscillation. However, as the grid is also used for controlling the current through the tube while oscillating, it is compelled to perform two different functions simultaneously and unless the circuit is very carefully adjusted, it fails in either one or the other. Usually the amateur will adjust the oscillator to get the most power into the antenna and then impress the signal upon the grid expecting perfect operation as easily as is secured in telegraphy by opening and closing the key. Such, however, is not what results. This system gives about 20% modulation, which is quite poor. To adjust this circuit to give complete modulation requires much more complicated apparatus that the amateur is likely to possess, and there is added the fact that the adjustment is not only difficult to obtain, but is difficult to maintain. The efficiency of such an arrangement is not very high. For an amateur who wishes to secure good range the system is not advised. If, however, one is merely interested in something which will talk a short distance, it is one of the easiest systems to construct.

Van der Bijl System

A system which we have used in many of our experiments is shown in Figure 6 and is known as the Van der Bijl system. It falls under a classification of systems known as "amplifier systems" in which a small amount of power is modulated and then the modulated current is amplified into the antenna. The modulation is done in this circuit by means of a tube in which we make use of its curved characteristic. In Figure 6 will be observed a small high frequency voltage with the time axis running downward, which is impressed upon the grid and whose position on the characteristic curve is varied by the signal to be transmitted. The varying slope of the characteristic curve causes the high frequency current in the plate circuit to change, depending upon what part of the characteristic curve this small voltage wave operates. If it operates around the point marked B, it produces the amplitude indicated directly to the right of the letter B. If it operates around the point marked C, it produces a much greater amplitude as is indicated to the right of that letter. If the signal should slide this wave down to the point A, practically no alternating space current occurs. We thus have the phenomenon of being able to get any alternating space current we desire by merely sliding the high frequency input up and down the curve. If we use the signal to slide this small input up and down, the amplitude produced in the plate circuit is such that a line drawn through the peaks (the envelope of the peaks, so to speak) is the wave form of the signal desired. Having once secured a small amount of modulated high frequency current, it is only necessary to amplify it up to the

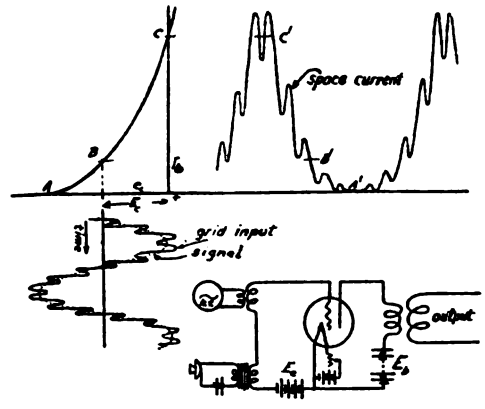


FIG 6 Van der Bijl's System

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desired power and put it on the antenna.

This type of system, though fairly simple, is not as good as some to be described later. It is however, as good and as efficient as any other amplifier system. That is, it is as good as any system in which a small amount of power is modulated by some means and then amplified to the desired point. The efficiency in these systems is determined by the efficiency of the amplifier and has very little connection with modulating arrangement itself.

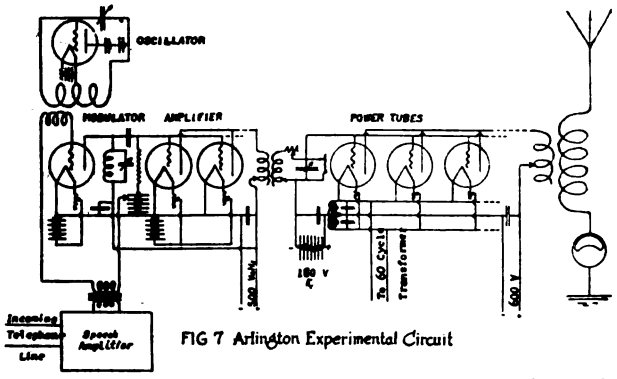


FIG 7 Arlington Experimental Circuit

The circuit which we used in our test at Arlington, 1915, is given in Figure 7. The average amateur should be able to pick out the oscillator, modulator and amplifiers in this circuit without much trouble.

Modulating Amplifier System

A modified form of the Van der Bijl system is that indicated in Figure 8. It is known as the "modulating amplifier" system. It differs in detail from the previous arrangement in that the high frequency wave impressed upon the grid is equal to or much larger than the signal wave, instead of being much smaller, and in that the modulator not only modulates, but amplifies and delivers the modulated high frequency current directly to the antenna. This system should be of some interest to an amateur because it is one he can quite easily construct. It requires, however, two or more tubes. One of the tubes must be used to generate the high frequency oscillations, while the other is used as the modulating amplifier. These tubes may be of different sizes; the one generating the high frequency oscillations does not have to be over 1/10 the power rating of the modulating amplifier tube. If the tubes are of very large size, it may be necessary to use a speech amplifier between the microphone and the modulating amplifier.

In a system of this kind, it is desirable to have a high frequency amplitude several times the signal frequency amplitude. The experimenter should vary the negative voltage (E_c of Figure 8 or E_{c_2} of figure 13) finding the values at which he gets maximum current and minimum current in the antenna. After having determined these values, he should set the negative voltage at about the value halfway between these limits, the value being that which will give ½ the maximum antenna current. The circuit it then properly adjusted for speech since the non-signalling value is ½ the maximum possible. He must not feel that he is cheating himself out of some power when he reduces the antenna current to half the maximum, because he is not. The speech signal coming in and being impressed will momentarily oppose the battery at times and cause the power to rise to the maximum, and at other times will momentarily aid the battery, causing the power to decrease to zero. He has a value about which the antenna current can both increase and decrease by the mere changing of the potential of the grid. This gives him a circuit adjustment which will produce an antenna current as indicated in Figure 1 or Figure 2. It can rise to a higher value as well as decrease to a lower value by a mere potential change which in this case is his grid potential, and he can get a properly modulated, if not a completely modulated, antenna current. The natural inclination of the amateur is to leave the value of E_c such as to give him the maximum antenna current. If he does this, he can only secure an improperly modulated current such as in Figure 3. His signal impressed from the transmitter and the transformer has alternating potentials which in some instances aid the battery

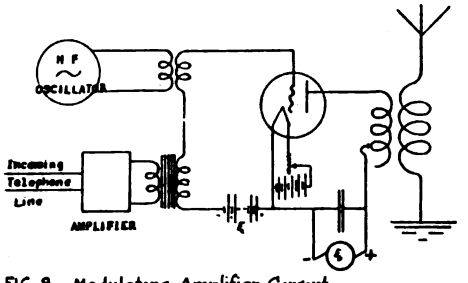


FIG 8 Modulating Amplifier Circuit

E_c, and other instances oppose it. At those instances where it aids the grid battery and makes the grid become more negative, the antenna current will be modulated in a downward direction. But in those instances when it opposes the grid battery and reduces the grid potential it should raise the antenna current. If he does not

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make the non-signalling antenna current half the maximum by increasing the negative grid battery he will be operating about the point of maximum antenna current and nothing he can do on the grid can ever make the current any greater. Since his speech signal contains equal amounts of

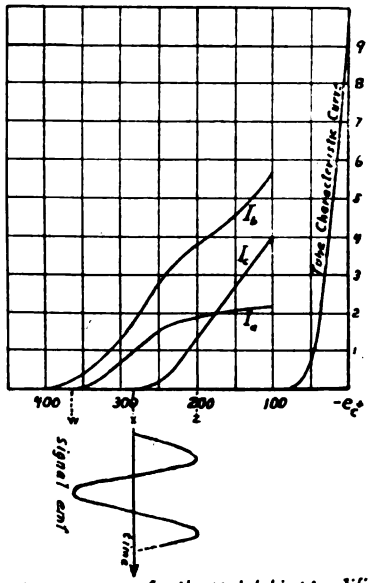


FIG. 9 Behavior curves for the Modulating Amplifier

positive and negative potentials which alternately aid and oppose the battery, he will get modulation only for that half of the signal which aids the battery, giving him the identical improperly modulated signal represented in Figure 3. To secure the complete radio signal, he must increase his negative grid voltage to such a value, as mentioned previously, as will allow the incoming speech signal to oppose the battery and increase the antenna current at times as well as to aid it and decrease it at other times.

A set of curves such as a person would get from a modulating amplifier is indicated in Figure 9. The curve for antenna current (I_a)' was secured by slowly varying the negative grid potential and taking readings of the antenna current at the same time. As we approach the value of 100 volts on the grid, it is seen that the antenna current is rising so slowly that it is not desirable to go any farther in that direction. In fact, for most work, it is better not to go to a smaller value than 200 volts. This is marked by the letter Z. Half way between this value and that value W at which the antenna current is reduced to zero is marked the value X which is the amount of negative voltage we would apply to the grid when not signalling. If now, we produce by means of a microphone and transformer the simple signal indicated with the time axis running downward, we can cause the potential of the grid to vary. The potential of the grid is the sum of the constant negative potential 280 volts and the varying signal potential, and the grid's potential will range between the points W and Z, causing the high frequency antenna circuit to vary between the maximum and minimum values.

(Part II, in our next issue, will deal with the constant current system and master oscillators, and concludes with circuits, specifications and constants of systems particularly suited to amateur use. If you're at all interested in radiotelephony, don't miss it.—Ed.)

The Troubles of a Trouble Shooter

By Radiotron Mike

PHILLIP ALGERNON FITZDOODLE was an Inquisitive Youth with a Homely Mug who got mixed up with a Farmers' Line telephone company because he needed a pair of shoes and Some Other Things. It was for this reason that he became a Sticker and in due time secured a fair knowledge of Dry Batteries and Pony Insulators. One day he felt a sudden urge to gain Distinction and he applied for a job of Trouble Shooter with a Big City Exchange where he found Higher Poles to climb and More Trouble to shoot for about the Same Money. This grieved him and he looked about for some One to share his Troubles with him. After he had received his Seventh Check he met a Baby Doll. In a short time they were Married and went to live on the Third Floor. Phillip thought that his troubles had greatly Diminished bus such was not to be the case.

One day a Squeak Box Pounder interested Phillip with a flow of Wireless Lingo and in a few hours he was talking about spark-gaps, oscillation transformers, radio calls, amplifiers, loose couplers and rheostats. The Wireless Bug had nibbled him and Bit Hard. Of course Phillip thought he would be Satisfied with 'most any kind of a set but such was not to be in the life of Phillip Algernon Fitzdoodle.

The Local Relay League was on the job. Soon an Amateur who was short of Cash but long of Wind appeared in the Scenery with a Home Made Set which he would gladly Sacrifice at a 1914 Figure because his Pa and Ma were going to move to

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California. Opportunity had surely taken Phillip's door to Wirelessdom off its hinges. He eyed the Outfit like a little Sod Buster does his first Pin Wheel and managed to scrape up enough Cash to call the Static Collector his very own. It looked like he was soon to become the sole owner of a Beautiful Collection of Junk but such was not to be.



Fitzdoodle's next problem was to get the Sweetest Girl to permit him to install Signor Marconi's Invention in the kitchen. So taking a chew of Ever Sweet and with his Rotary gaining in speed he started homeward looking like a Moving Van. When Phillip arrived at the Proper Address the Sweetest Girl met him on the First Flight with an Icy Stare. She thought he had robbed a Freight Train and the Wild Look in his eyes indicated to her that the Authorities were hot on his trail. Of course her fears were without a Ground and she was only Up In The Air. Phillip told her what had happened from the time the bug had Sampled him until it had socked in its stinger to the hilt. He explained that by hooking up the instruments Properly which he understood Perfectly that both could hear the zippety zips of wireless operators many meters away. The only meters she knew anything about were Gas Meters and they were very expensive. She thought that all meters were alike. Phillip received the Coolest Reception that had ever been held in his Honor. He knew that the Great Out Of Doors was very much crowded in his neighborhood and that His Landlady would land on him if he attempted to erect an aerial in her Roof Garden. So he promised his Unknown Factor everything that he could not deliver from a High Powered flivver to a Seal Skin coat next winter but she would not budge. Phillip Algernon Fitzdoodle who had been Master of the Apartment was now an Unwilling Slave to a Beautiful Blue Eyes who was often too lazy to punch holes in her own dough-nuts. This could not continue with Phillip Algernon Fitzdoodle.

As Phillip sat looking out of the window wondering what he could do to make his Bitter Sweet oscillate the telephone bell rang. The Voice of a member of the Local Relay League said that he had heard Phillip was interested in Wireless and invited him to call and "Listen In" on a Real

(*Concluded on page 17*)

Power Factor in Oscillating Circuits

FEW articles in QST have started so much deep thinking and so much violent discussion as the "Wherefores" of Mr. M. B. West in February's QST. We published a few communications on the subject in the April number but they were merely the advance guard of an army of letters of such proportions that we just had to stack them up in the corner until we had a holiday to dig into them and see what all the shooting was about.

We acknowledge particularly interesting communications from Messrs. S. E. Anderson, Brooklyn; M. B. West, Waukegan, Ills.; E. W. Stone, San Francisco; John K. Andrews, Pittsfield, Mass.; Fred. Winkler, Jr., New York; J. A. Morris, New Britain, Conn.; F. F. Hamilton, Indianapolis; and E. L. Powell, Washington, D. C. Chief discussion has centered on the question of power factor in oscillating circuits—certainly a thing that every radio man *ought* to know about—and we have been enjoying the spectacle of two about equal groups of well-versed men, most of them engineers, taking diametrically opposite views of a vital subject, one side insisting that power factor in an oscillating circuit can be nothing other than unity, while the other side just as strongly contests that it is zero. Now textbooks define the matter pretty well, but all of these men are intelligent, so it isn't likely that we would find half of them just uninformed—the matter isn't nearly that simple. The trouble is largely in that half of the time they aren't talking about the same thing! Surprising, however, is the confusion regarding fundamental A.C. theory and

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definitions, and wonderful have been some of the combinations of vector diagrams for parallel resonance circuits accompanying formulae for series circuits, and vice versa, and great has been the dispute! All over the country there have been signs of activity, and, as we know from experience, if there's anything that will drive a man looney it's to attempt to review A.C. theory at one sitting—or even in a week. But cobwebs have been brushed off the old textbooks, "slip-sticks" broken out to light of day, headaches acquired with the sudden realization that even simple algebra was a forgotten language; wives, sweethearts and radio sets have been neglected, two chaps have even come to Hartford to argue the matter; and surely much good has come of all of it.

We are not half sure in our own minds that enough light has been shed on the subject but certain things do stand out and should be realized in clearing the air for further discussion of possible practical improvements in circuit arrangement:

(1) The theory of power factor in radio frequency circuits isn't different from that applying to A.C. power circuits—the well known formulae and practices still hold.

(2) The closed oscillating circuit of a spark transmitter is a series circuit, not a parallel circuit, and such a series circuit has but one "current" flowing thru it.

(3) In such an oscillating circuit the capacitive reactance volts are numerically equal to and opposite in polarity to the inductive reactance volts, whereby the two reactances cancel. The only remaining voltage drop occurring is that across the apparent resistance of the circuit, which voltage (supposing a perfect condenser without phase displacement) is always exactly *in phase* with the current. The power factor is therefore *unity*, not zero.

(4) It is true that there are large voltages across both the inductance and capacity but they exactly offset each other at resonance and the true power is found by multiplying the current (there is but one current in a series circuit) by the voltage *across the circuit* (not across either inductance or capacity). No amazing values of watts will then be found.

(5) This should not be confused with the fact that there truly is a phase angle of 90 degrees between the current and the voltage across either inductance or capacity. It is this phase difference that has sent so many good men on the wrong track, but it has no bearing on the power factor of the circuit as a whole which must be computed on the resultant voltage across the circuit as a whole and not on that across any one part of it.

(6) We could discourse somewhat similarly upon a parallel circuit, where again the power factor at the resonant frequency is always close to unity and cannot be otherwise.

With which we take pleasure in presenting the following article which by correcting any misimpressions concerning the fundamental *theory* will, we trust, settle the dust for further discussions relating to improved *design*.

Some of the Wherefores of Radio

By S. E. Anderson

WE all remember the articles by Mr. M. B. West in the February number of QST, in which he frankly invited discussion of a number of the perplexing everyday problems of radio. The opening salvo of this discussion appeared in the April number, and certainly emphasized the fact that there are a number of things in this great game of ours that it will pay us to stop and think about.

I am writing this article in order to throw what light I may on some of these problems, which I have endeavored to discuss in the light of my own experience, tho I wish it thoroughly understood that I am laying no claim to infallibility. The larger part of the discussion has been concerned with that elusive young scamp, power factor. I think our chief trouble has been that we are a bit afraid of it, just because we are dealing with a few more cycles than most of the text books talk about.

To touch briefly on the other points of Mr. West's article, his first question is, "Why is there an optimum wave length for any given antenna?" The letter, if not the spirit, of Mr. Stone's explanation in the April QST is, I think, entirely correct. We have a number of factors involved, some increasing with wave length, and some, notably the radiation resistance, being much smaller for the longer wave lengths, and the point at which the sum of these various factors is a minimum is the best operating wavelength. But I most certainly agree with Mr. West that in view of the extremely varied conditions under which amateur antennae are erected it is almost impossible to calculate this optimum wave length in advance. From the waves one hears on the air, it is generally more than two hundred meters!

I will not attempt to discuss the apparent greater efficiency, measured in miles per watt, of C.W. apparatus. I must admit that I have never been entirely satisfied with the usual explanations offered, but I have none that are any better, and the factors involved are so numerous that it

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could well form the subject matter for a series of articles by someone with experience in the C.W. field.

Now let us look at this matter of power factor, avoiding mathematics as much as possible, but not being afraid to use it where it will help. I have of necessity assumed that we are all either familiar with the proof of the fundamental relations which I state or else we don't care anything about this proof. These relations, in the final analysis, can be developed only be the use of The Calculus, for which I am sure we all have, to say the least, the most wholesome respect.

It can be safely assumed, I think, that we are all familiar with the fact, as explained in Mr. West's article, that with alternating current the current flowing through an inductance lags behind the voltage across it, while the voltage across a condenser lags behind the current flowing through it. If we have a simple series circuit as shown in figure 1, consisting of a resistance of R ohms, an inductance of L henries, and a capacity of C farads, and apply to the circuit a sinusoidal E.M.F. whose effective value is E volts, and whose angular velocity is ω radians per second, where ω is 2π times the frequency in cycles per second, it may be shown that the effective value of the current through the circuit will be

$$I = \frac{E}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}} \qquad \ldots\ldots(1)$$

A vector diagram will be most helpful in our discussion, and one is shown in figure 2. Starting with the current I, we draw the vector representing it, and in phase with it the vector RI, the voltage across the resistance. 90° ahead of the current is the voltage across the inductance, ωLI, and 90° behind the current is the voltage across the condenser, $\frac{I}{\omega C}$. The vector sum of these three potentials is the total impressed voltage, represented by vector E. In general this voltage will not be in phase with the current, the cosine of the angle θ between them being called the power factor, and it may be shown that the power is

$$W = I^2R = EI \cos \theta \qquad (2)$$

Now it is obvious from equation (1) that if we make ωL equal to $\frac{1}{\omega C}$, the current will be a maximum and equal to $\frac{E}{R}$,

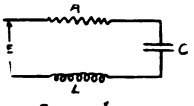


Figure 1.

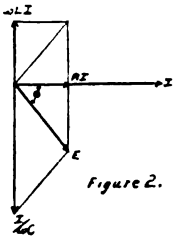


Figure 2.

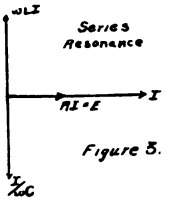


Figure 3.

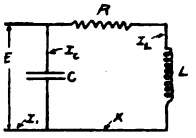


Figure 4.

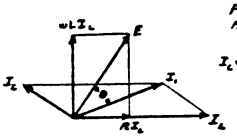


Figure 5.

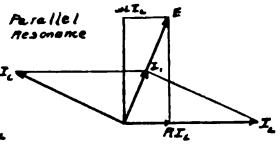


Figure 6

and the vector diagram will be of the form shown in figure 3, the current and voltage now being in phase and the power factor unity.

Let us now consider the case of parallel resonance, in which we have an inductance, resistance, and capacity connected as shown in figure 4, the constants being represented and measured in the same manner as for equation (1). With a sinusoidal E.M.F. applied at E, the current through the condenser will be

$$I_c = -\omega CE \qquad (3)$$

and the current through the inductance and resistance will be

$$I_L = \frac{E}{\sqrt{R^2 + \omega^2 L^2}} \qquad \ldots\ldots(4)$$

The vector sum of these two currents is the total current, or

$$I_1 = E \sqrt{\left(\omega C - \frac{\omega L}{R^2 + \omega^2 L^2}\right)^2 + \left(\frac{R}{R^2 + \omega^2 L^2}\right)^2} \qquad \ldots\ldots(5)$$

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The vector diagram of this circuit is shown in figure 5. Starting with the current through the inductance, I_l, we draw the vector representing it, and in phase with it the vector RI_l, the voltage across the resistance. 90° ahead of the current is the voltage across the inductance, ωLI_l, and the vector sum of these two potentials is the total impressed voltage, E. The current through the condenser, represented by vector I_c, is 90° ahead of this voltage, and the total current, I_t, is the vector sum of I_c and I_l. In general this will not be in phase with the impressed voltage, and as before the cosine of the angle θ between them will be the power factor.

It is apparent from equation (5) that if we make

$$\omega C = \frac{\omega L}{R^2 + \omega^2 L^2}, \text{ the current has its minimum value of } I = \frac{ER}{R^2 + \omega^2 L^2},$$

and will be in phase with the applied E.M.F., while the vector diagram will be of the form shown in figure 6.

It will be noted that in these equations, the effective resistance of the condenser has been neglected, tho not that of the inductance. The losses in any but the poorest paper condensers are negligible for any analysis which does not require extreme precision, but the resistance of many of the large air core coils used in radio work is frequently of considerable magnitude. In many circuits, however, the resistance may be neglected, and if this is true we have the condition that for either series or parallel resonance $\omega L = \frac{1}{\omega C}$, and at the resonant frequency the voltage across the series circuit is zero and the current is infinite, while with the parallel circuit the voltage across it at resonance is infinite and the current is zero, as is apparent from an examination of the equations.

Now if we take the circuit shown in figure 1 and connect a spark gap at E, we have the typical oscillating circuit of the spark transmitter, which is the same circuit as would be obtained by taking our "parallel resonance" circuit of figure 4 and inserting a spark gap at X. I think this is one point where some of us have been getting off the track. The ordinary spark transmitter circuit looks like a parallel resonance circuit at first glance, but it is apparent, once it is pointed out, that as far as the radio frequencies are concerned it is a series resonant circuit.

When free oscillations occur in such a circuit as is represented in figure 4 with a spark gap at X, there being no external potential applied at E during the period of oscillation, it may be shown that the instantaneous value of the current is

$$i = I_o \varepsilon^{-\alpha t} \sin \omega t \qquad \text{.....(6)}$$

where I_o is the initial current, α is the damping factor, and t is the time elapsed since the starting of oscillations. Taking E_o as the initial potential across the condenser, the values of the constants are as follows:

$$I_o = \omega C E_o \quad \alpha = \frac{R}{2L} \quad \omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} \qquad \text{.....(7)}$$

In any oscillating circuit worth mentioning, the ratio of inductance to resistance is large, so the last term of the expression for ω is negligible and it may be written $\omega = \frac{1}{\sqrt{(LC)}}$, which is identical with $\omega L = \frac{1}{\omega C}$, which, from equation 1, is the condition for resonance of the series circuit, or *the frequency of a circuit in which there exist free oscillations is the frequency for which the circuit is resonant, or has unity power factor.*

To consider this from the practical man's viewpoint, let us assume for the moment that the circuit did not oscillate at the resonant frequency. The impedance of the circuit is a minimum at this frequency, so if it were oscillating at some other frequency we would have the impossible condition of a current flowing in an electric circuit which was less than the maximum possible current. This oscillating circuit is entirely self-contained with nothing external to it to control the frequency, so it will naturally be the frequency which will permit of the maximum current, or the resonant frequency.

In Mr. West's article, referring to his figure 3, I think his error is in not considering the proper voltages and currents when he talks about power factor. We have a simple series circuit, in all parts of which the same current is flowing. The voltage across the inductance is 90° ahead of this current (with zero resistance), and the voltage across the capacity is 90° behind. Mr. West asks us to consider the power factor at some point such as A, but I know he is thinking of the voltage *across* the circuit, as shown by his arrows, and the current *in* the circuit, which have no relation to each other at all. *The power factor of this circuit at resonance is unity, and the power in the circuit is the product of the current by the voltage AROUND the circuit, which is only the drop across the resistance of the inductance and the spark gap, if present, and is very small.* Thus even tho the current may reach enormous values, its product by the *proper* voltage gives us a reasonable value for the power. If we have a parallel resonant circuit (figure 4 of this article) such as

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occurs with tube hookups, its power factor will also be unity. The voltage E across the circuit will be very high, and although the current through the condenser (I_c) and that through the inductance (I_1) may be very large, the current *through* the circuit (I_1) is very small, so multiplying it by the voltage across the circuit does not give us ten kilowatts from a five watt tube.

With these facts in mind it is apparent that we gain nothing directly from such an arrangement as is shown in Mr. West's figure 4. Any transformer functions by virtue of its inductance, and the phase relations in the transformer windings will be the same whether the windings contain one turn or ten.

From exactly the same considerations, the power factor of our antenna circuit will be unity when it is tuned to resonance. I have never studied the theory of the multiple tuned antenna, but I am sure that its increased effectiveness is due to something other than an improvement in power factor, such as the increase of the ratio of inductance to capacity and ohmic resistance, and the better resulting current distribution over the entire length of the antenna.

Mr. Winkler in his discussion gives us a very good picture of the negative power loops which occur when the power factor is not unity. I think his error is in considering an oscillating circuit as a parallel circuit when he drew the vector diagrams, and then considering it as a series circuit when he wrote the equation, while he also seems to lose sight of the fact that when the resistance is small the frequency of a freely oscillating circuit just naturally has to be the frequency for which the circuit is resonant.

Referring to paragraph 3 of Mr. West's discussion in the April number, it might be well to emphasize that we have resonance when the inductive and capacitive reactances are equal, and that the constants of the latter occur in the denominator. We all know that if we want to obtain the same frequency with twice as much inductance, we require only half the capacity, so we have an infinite number of combinations of inductance and capacity for any given frequency, *but only one pair of values of inductive and capacitive reactance.* I think the other points in this paragraph have been covered.

Referring to parapraph 4, Mr. West is perfectly correct in stating that there is always a critical combination of inductance and capacity which gives the best results for any given wave length. The reason for this is our old friend—resistance. *The optimum combination of inductance and capacity for a given wave length is that combination for which the time constant of the inductance is a maximum, when this time constant is defined as the product of the inductance and the angular velocity, divided by the resistance.* (Written $\frac{\omega L}{R}$). The rigorous proof of this fact is somewhat involved, but its truth is obvious. It simply means that the more efficient we are able to make our inductance coils the better our circuits will be, and that we should choose a coil which has the highest possible time constant over the frequency range it is desired to cover. I had convincing proof of this in some recent work with vacuum tube oscillators, in which replacing a coil by another of the same inductance, but with a time constant about four times that of the first resulted in a great increase in output, as well as a much improved wave form and greater stability, the net improvement being much more than proportionate to the increased time constant of the new coil.

In conclusion I wish to say that I have tried to maintain throughout this article the same spirit which prompted Mr. West's original speculations. It is only by thus sharing our problems and opportunities that we can make any real progress. I have covered most of the major points raised, tho space does not permit as detailed discussion as the subject deserves. I have tried to avoid mistakes, but as this is impossible, I shall be glad to have them pointed out, and will welcome additional ideas.

THE TROUBLES OF A TROUBLE SHOOTER

(*Concluded from page 13*)

Set. Could Phillip turn down an offer such as this? He could not, and his promise to appear at a certain place at a certain time was rarely ever a Brass Brick.

It would be easy to tell how it all Happened but let us make a Short Story of it. Phillip did induce his Storm and Strife to accompany him and in an hour both were sitting in front of the Bakelite. A few adjustments by Friend Indeed brought in a few zippety zips and another little Twist and the sweet strains of "Carry Me Back To Old Virginny" floated in from KDKA. Phillip handed his Sour Grapes another set of phones and both listened to the Music until they had to be Kicked Out.

The Sweetest Girl has given up her Sewing Table on which rests a Short Wave Set. Over the sink swings a box aerial. A loud speaker dangles from the spot where a picture of Bread Pudding previously decorated the wall. A shelf in the cupboard is devoted to batteries and Mrs. Phillip Algernon Fitzdoodle is again devoted to her husband.

Phillip often comes home with a pocket full of Trouble Tickets and a Grouch but he tunes up a Real Set and floods his Happy Apartment with Music long after he has finished washing the dishes.

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The Ideal Relay Spark Station

By R. C. Denny, 6CS

In Two Parts: Part II.

The Spark Gap

This is another part of the apparatus that is generally not so well understood. The spark frequency and the quenching are vital factors in the success of the transmitting set. In the great majority of relay stations the rotary spark is used, and it is generally acknowledged to be the best all-around gap. It gives a fairly good smooth tone over a considerable range of voltages and spark frequencies, and besides is quite easily cooled, in fact is self cooled; and may have very good quenching characteristics also.

Synchronous rotaries are indeed the most desirable, but unfortunately are most impossible to get hold of except at considerable expense. Their speed holds in step with the frequency of the supply current, and the sparks may be timed to occur at the most favorable points of the voltage wave. This condition can be very closely approached with a non-synchronous motor in connection with a rotary gap, if certain conditions are observed.

Spark frequencies of from 500 to 600 per second are quite effective, and besides being pleasant to the ear, are generally high enough to work the condenser up to the power rating of the transformer. A rotary for operation on a 60 cycle system, should be equipped with a rotor having a number of studs equal to some submultiple of 60, say 12; and be operated at a speed that will give a spark frequency equal to some multiple of the current frequency, say 600. Thus the 120 alternations or waves per second may be divided up equally, and the spark timed, so that no stud is opposite an electrode at the zero point on the wave. A twelve stud rotor would have to run at 3000 RPM to give 600 sparks per second; while the same spark frequency could be obtained by running a 6 stud rotor at 6000 RPM. For a rotary on a 50 cycle system, the same reasoning applies. A spark frequency of 500 is desirable, and may be obtained by running a 10 stud rotor at 3000 RPM or one of 5 studs at 6000 RPM. In the case of the higher speed rotor of fewer studs, the quenching would of course be much improved, which is very desirable. Other combinations of speed and studs will suggest themselves. To be able to time the sparks properly, the stationary electrodes should be mounted on a yoke which may be turned through a few degrees about the shaft, and clamped at any desired position. It is adjusted till the spark gives the very smoothest tone, and the radiation ammeter should show an increase at this point. (Note 4.)

Needless to say, perhaps, studs and electrodes should be flat and wide, and the gaps set at a very minimum, just sufficient to clear. Furthermore the edges of the studs and electrodes must be exactly parallel, or the sparks will occur at the closest point only and the advantage of the large cross section be lost. Inclosed rotary spark gaps are a luxury, but well worth while. Quenching is better and the

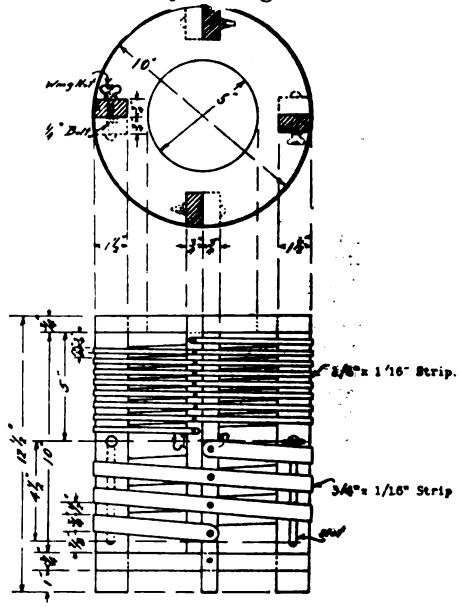


FIG. 5

objectionable noise and light from the spark is entirely overcome. There are so many medium priced rotary gaps on the market that it is hardly worth while to undertake building one, especially since the motor itself is the main item of cost, and would have to be purchased in any event.

The Oscillation Transformer

This is at least one instrument that can be built and operated by most any amateur. There are in use two general types, the pancake or spiral, and the helical. The latter is probably the better transformer, because it produces a uniform and undistorted magnetic field. The main points to

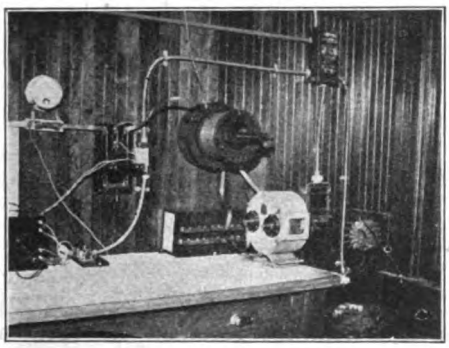
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remember in designing an oscillation transformer are to use large conductors, spaced sufficiently on a good insulating material, in such a manner that the distance or coupling between the two coils is variable.

The drawing shown herewith (Fig. 5) illustrates a very simple yet efficient oscillation transformer, good for 1 KW or more. The frame may be made of 'most any sort of wood, if it is thoroughly dry. There is little or no need of using more than two or three turns in the primary for 200 meter work, while six or eight turns in the secondary will usually be found sufficient. Dead turns are not to be desired, and if any exist after the set has been tuned up, they had better be cut off. Only one of the uprights in each pair need be slotted for the sliding coupling. The bolt in the others may be fixed solidly by countersinking a nut in flush. The metal strip used may be either copper or brass, and fastened to the frames by round head, nickle plated wood screws.

The Radiation Meter

This may be a hot-wire ammeter or an instrument of the thermo-couple type, of 0 to 5 amperes scale. However, it is



ARRANGEMENT OF APPARATUS

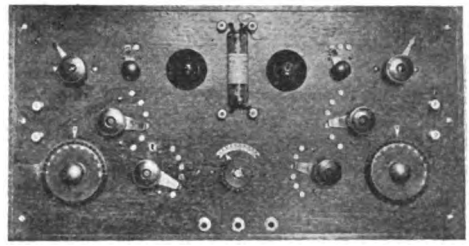
of hardly enough importance to justify much of an investment. Its chief value is in getting the highest indication when tuning the set up, and whether the reading represents actual amperes or not is a matter of small consequence. After that it is of very little use, and should be cut out of the circuit entirely or shunted with a single-pole single-throw knife switch.

The Key

Little need be said about this piece of equipment. Any easily adjusted smooth-working key, of 10 amperes capacity, is sufficient for a 1 KW installation; preferably one in which conducting strips are used to convey the current to the contacts, instead of depending upon the trunnions for that purpose. Fads in keys are rather to be lamented, as there is enough poor sending without them.

Arrangement of the Transmitter

Little need be said in this connection, as amateurs who pretend to be relayers in any sense of the word have a very good understanding of these pre-requisites. However, the accompanying photograph is presented as a good example of the compact arrangement of a transmitting set, which is necessary in order to have very short leads in the closed oscillatory circuit. All conductors of this circuit should be of comparatively large cross-section, to offer little resistance to the high frequency current. It will be noticed that

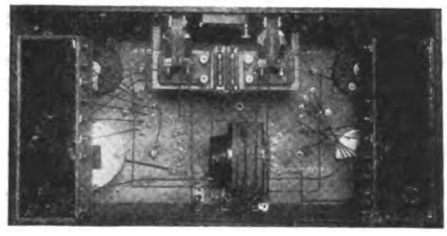


PANEL ARRANGEMENT OF REGENERATOR

the inclosed rotary is mounted with the pulley over the edge of the table, and the driving motor on the floor. This does away with excessive vibration, and gives more room on the table.

Tuning the Transmitter

For the accurate tuning of a set, a calibrated-by-standard wave meter is absolutely necessary. However, as this is an instrument that few amateurs possess, it is often necessary to resort to some approximate method. As most amateurs have some sort of receiving set, more or less sensitive, there is no reason why the receiving set itself should not be used as a wave meter. The amateur is perfectly familiar with tuning in 200 meter stations, and can adjust his circuits to the point where he gets some particularly sharp-tuned 200 meter station best. Then using his receiving set without changing any of the adjustments, as a wave meter, he may tune the transmitting set.



INTERIOR OF SHORT WAVE REGENERATOR

To tune the closed oscillatory circuit, the tuning coil or inductance of the receiving set should be brought into close

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inductive relation to the primary of the oscillation transformer. The contacts of a small buzzer should be connected in place of the spark gap, in series with the condenser and primary. On operating the buzzer, this circuit will be excited by the spark at the contacts. The primary tap should then be varied on the oscillation transformer until the spark tunes in sharp at the 200 meter adjustment of the receiving set. In all probability one turn of inductance will be found sufficient, or possibly some fraction of a turn more or less.

The open circuit may be tuned independently of the closed circuit, by cutting the buzzer contacts in the ground lead, and with the tuning coil of the receiving set in close inductive relation to the secondary of the oscillation transformer and the aerial connected in its place at some point on the secondary. Then without changing the receiving set adjustments from the previous test, the buzzer should be operated and the secondary turns varied, until the spark tunes in sharp at 200 meters as before. Then on placing the primary and secondary in inductive relation, with comparatively loose coupling, and operating the set with the power on, a wave of very nearly 200 meters will be emitted.

Another method would be to simply use one turn in the primary and, operating the set, change the secondary turns, while comparatively closely coupled, until the apparent radiation was at a maximum. One trouble with this method is that the radiation might be so low, due to very little power being used, that a variation of several turns in the secondary might not have an appreciable effect on the indication, although the variation would alter the wave length considerably. The better idea would be to borrow a reliable wave meter, or to wind up an inductance and have it calibrated in connection with a variable condenser, borrowed from your receiving set for the time.

The Receiving Set

There are an infinite number of hook-up for receiving sets, and it would be folly to attempt to say which is the best. At any rate a short wave regenerative set, with two steps of amplification, is essential to an up-to-date reliable relay station. Whether the variometers or condensers are more effective is still very much a matter of opinion, and very wonderful work has been done on sets of both kinds.

The set described herein and shown in accompanying photographs and drawings has been giving splendid results on an in-

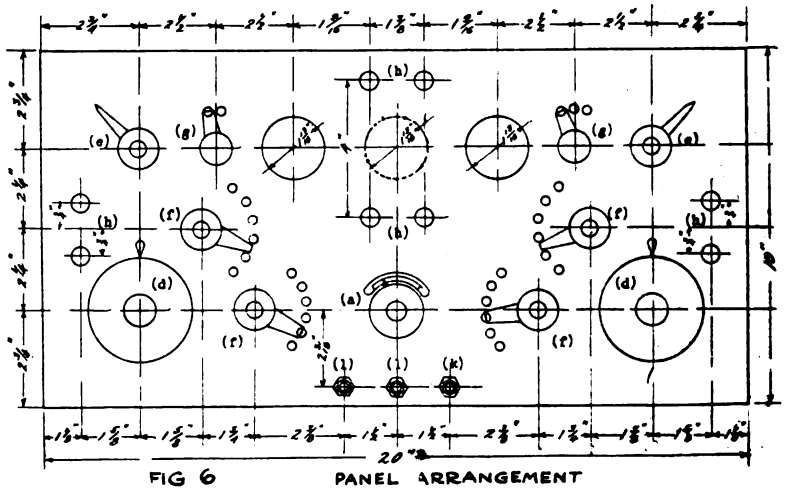


FIG 6 PANEL ARRANGEMENT

verted L indoor aerial of average height 15 feet from the ground. In fact, all efficient amateur stations within a thousand miles are heard. It is built up of standard parts bought from different dealers, as indicated in the list. The cabinet is built of mahogany, including the panel, and nicely finished, costing about $5.50. The symmetrical arrangement of the parts gives the set a very pleasing appearance, and they had just as well be arranged that way as not. Since the tubular audions are no longer on the market, it is suggested that a third hole be put in as indicated by the dotted line, to accommodate a detector tube of the standard base type. The drawings and photos so clearly show the set, inside and out, that detail construction points hardly need be discussed. A full size drawing should be made up first and fastened to the panel, and all the center points transferred to the panel by punch marking. This saves scratching up the finish, as probably would occur in trying to lay out the arrangement (Fig. 6) directly on

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the panel. Wiring up the set is the biggest job of all, and requires considerable patience, more than anything else. No. 14 bare copper wire was used in this set, and cut and bent to fit. It makes a very rigid job, and has a neat appearance. When using both amplifiers, the points on the filament switch are simply bridged by the lever arm, which is found to be entirely satisfactory. This set has a remarkable range of selectivity, and is recommended to all who are ambitious to build their own sets. It represents probably the best possible arrangement of the necessary apparatus, at the very minimum cost.

(k) 1 No. 1421W. Federal Phone Jack.
(l) 2 No. 1422W Federal Phone Jack.
(m) 1 No. 1428W Federal Phone Plug.
(n) 2 No. 226W Federal Amplifying Transformers.
(o) 2 Marconi VT2 Amplifying Tubes.
(p) 2 Marconi Tube Sockets.
(q) 2 Marconi 2 Megohm Grid Leaks.
(r) 1 Audiotron Double-Filament Detector Tube.
(s) 2 Kennedy 45 Volt B-Batteries.

Comments

Note 4. As a non-synchronous motor cannot be expected to hold in synchronism any great length of time, the choice of speed described would not prevent electrodes coming into opposition at times when the voltage is too low to jump.

Such speeds "are generally high enough to work the condenser up to the power rating of the transformer", but we must point out that that does not mean greater range, in spite of increased antenna current, because it is the power in *each wave train* that makes the noise at the other end. For that reason we recommend that attention be given methods that put the greatest power in each discharge, such as the use of high voltages and a low spark note, preferably synchronous so as to discharge the condenser at or near peak voltage.—*Editor.*

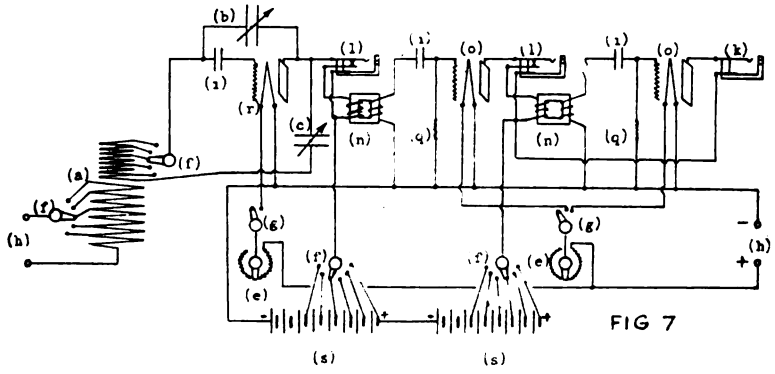


FIG 7

The location of the component parts of the set is indicated in the panel layout (Fig. 6) and in the circuit diagram (Fig. 7) by the letters used in the following list:

(a) 1 Sears-Roebuck SCR-54 Variotuner.
(b) 1 23-Plate Illinois Variable Condenser, Style No. 1.
(c) 1 43-Plate Illinois Variable Condenser, Style No. 1.
(d) 2 Sears-Roebuck Moulded Dials, No. 6A-9349.
(e) 2 No. 81 Remler Rheostats.
(f) 4 No. 82BP Remler Control Switches.
(g) 2 No. 84BP Remler Control Switches.
(h) 8 Murdock Binding Posts.
(i) 3 No. 358 Murdock Fixed Condensers.
(j) 1 Pair No. 55 Murdock 3000 ohm Phones.

Spark Reception on Honeycombs

By Charles Kinyon

IN the January QST I read with interest the article written by "A Novice" regarding the use of the Honey-Comb coils, also the articles written by Mr. Groves in the January and previous numbers. I noticed "A Novice" requested that other amateurs of less ability than Mr. Groves give their experiences with the H. C. coils and in accordance with this request I will set down my experience with them and hope the article will be of some value to the craft in general.

I do not claim that I have been able to get any exceptional results and in fact not as good results as Mr Groves has reported and doubtless many other amateurs

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Without in the least intimating that Mr. Kinyon's "grey matter is a little less grey", as "A Novice" put it, here is a more or less elementary exposition of tuning honeycombs which we know will be interesting to our readers. Mr. Kinyon confines himself pretty well to the reception of damped signals by the zero-beat method and altho most of us incline to the belief that the true field of the honeycombs is above 600 meters, Mr. Kinyon's article shows what can be accomplished with them in amateur work and, what is important, tells how to do it.—Editor.

have done better also, but I do believe that many amateurs are getting very little out of the H. C. coils in comparison to what could be gotten out of them by careful adjustment along more nearly correct lines. I have heard considerable criticism of the Honey-Comb coils from amateurs in this vicinity and I do not think it is justified by the action of the coils when properly handled. Of course the coils have their defects and in time will doubtless be improved upon but at present I do not know of any better receiving equipment for long waves or for a universal equipment to receive all waves from 150 meters to the highest around 20,000 to 25,000 meters, damped and undamped.

According to all the information I can get Salt Lake City is about the worst place in the world to get radio signals into and out of. It is surrounded on all sides by high mountains and in addition the soil is very sandy and dry a great part of the year. Before the war I had a loose coupler set in Kansas City and was getting pretty fair results with it but when I unpacked it here and set it up I could hardly get the Pacific Coast 600 meter stations on it and even after making several improvements in it results were greatly under what I thought they should be as compared with work in Kansas City. I then got the Honey-Comb coils and from the first got much better results with them than with th loose coupler.

In order that others may have some method of comparing their results with what I have been getting I will give some idea of the range I can receive from and if any one will remember that a station on the coasts or in the middle west should be able to receive from 1½ times to 2 times the distance with similar equipment I believe they can readily determine if they are getting as good or better results.

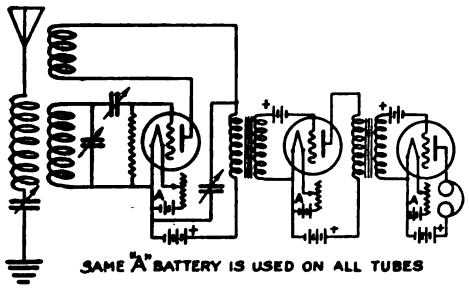
Amateur stations are received from the following points fairly regularly: Portland, Oregon, and south along the California coast to San Diego, Calif.; eastward to Roswell, N. M., and Douglas, Ariz., Anthony, Kans., Wichita, Topeka, Omaha, a station or two in Dakota, several stations in Montana. On commercial waves I can get coast stations on 600 meters with no aerial or ground. I frequently hear boats reporting their position 1,500 to 2,000 miles south and west of San Francisco. Undamped waves are received from Alaska, Hawaiian Islands and occasionally Guam and the Philippine Islands, Mexico City, NBA Panama, eastern coast stations, NSS, WII, WSO, NDD, NAA and at times I have heard POZ, LCM, and MUU but these last are uncertain and are probably only received during favorable conditions. I have a two-step audio-frequency amplifier in service but find that one bulb will bring in any signals that can be read on the amplifiers provided there is no noise about the house to drown out the weak signals.

I am willing to admit that if anyone will be content with a wave length range of 200 to 600 meters or so, the regenerative set of the so-called Paragon type may be superior from the standpoint of quick adjustment, probably has a greater distance range also; however, as far as I have been able to personally compare the Honey-Comb coils with regenerative sets in this territory I seem to be able to hear amateurs as far away with the Honey-Comb coils as the other fellows do with the regenerative sets and also get a tone which I like better.

Most amateurs, I believe, are never satisfied with their sets regardless of what type, kind and amount of equipment they may have. This is probably due to three principal causes; first, the type and size of aerial is governed more by the room available in which to string it and by the supports it is possible to use than by the amateur's actual beliefs of what would be the best type and arrangement from an operating standpoint; next, the average amateur when starting to build his first set knows very little about what kind of apparatus is really best and must depend very largely on reading advertisements and generally buys at least some articles which he later finds to be greatly outclassed and later when he goes to construct a better set the third item, lack of money to buy what he then knows to be best, induces him to re-use certain parts of the old equipment which he hopes will answer the purpose but which he knows will not perform as well as other parts would do. My own set I know suffers to a greater or less extent from these causes. My aerial is not at all what I would consider ideal, either as to shape or location. The best arrangement I could get out of it seemed to be as follows: I have a pole 55 feet high set at one side of the house and the other end of the aerial is supported by a combination electric light and telephone pole which is about 30 feet high but the ground where the pole is set is

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about 10 feet higher than the ground where the house pole is set. The aerial itself is of the inverted L type with the flat-top part consisting of 4 No. 14 copper wires spaced 2 feet apart about 60 feet long, with the free end about 35 feet above ground, and the end from which the lead-in comes off is about 50 feet from the ground. The lead-in consists of 4 No. 14 copper wires tied together and fanned out to meet the flat top portion. The ground is connected to the city water pipes and a pipe driven into the ground



but due to the sandy and dry condition of the ground this proved unsatisfactory for short wavelengths, long wavelengths coming in satisfactorily. This condition was eliminated by burying a single strand of No. 14 copper wire about 4 inches under ground and directly under the aerial. 200 meters then came in satisfactorily but of course more than this would be necessary to fit the aerial for efficient sending.

The receiving set consists of an assortment of H. C. coils from L-25 to L-1500, a Clapp-Eastham variable condenser of .0007 m. f. capacity in the aerial circuit, with a switch to change from series to parallel. (One of the DeForest vernier .0015 m. f. would be preferable and for larger aerials probably the loading condenser of .003 m. f. could be used to advantage.)

The secondary circuit uses a DeForest grid condenser, capacity unknown but probably close to .0005 m.f.; shunt condenser is a Murdock capacity nearly .001 m. f. but this condenser especially should be of the vernier type as it requires very accurate adjustment to obtain good results on short waves. I am using an old style DeForest tubular bulb purchased before the war as a detector and find it the best bulb I have tried although I have used the Marconi Class I and the Audiotron bulbs successfully. The tickler circuit besides the H. C. coil contains the "B" battery and a telephone jack arranged so that the telephone receivers may be plugged into the detector circuit when desired and when pulled out the jack contacts pick up the primary winding of the Federal amplifying transformer. At present I am using a variable condenser of about .0007 m. f. capacity around the "B" battery and the telephones or amplifying transformer windings but a condenser having a capacity of .004 or .005 m. f. would be much better. On account of the small condenser in use in this circuit I find it necessary to introduce a small loading coil in series with the H. C. coil in the tickler to enable me to get a satisfactory plate adjustment on the short waves. With a suitable plate condenser I think the circuit would be improved by leaving this loading coil out. I am using a grid leak made of lead pencil marks between binding posts on a piece of fiber. I prefer this leak to the Marconi on account of the ease with which the resistance may be varied to suit conditions.

The first step of the audio-frequency amplifiers uses a Marconi Class II tube connected as usual to the secondary of the transformer with a "C" battery of 1½ volts connected negative side to the grid. No condenser or grid leak is necessary in this circuit. A potentiometer to vary this "C" battery voltage would probably increase the amplification but as yet I have not installed it The plate circuit uses about 100 volts "B" battery and is hooked up through a telephone jack to enable the telephone receivers or primary of the scond Federal transformer to be inserted at will.

The second step is hooked up like the first except that a W. E. Co. VT-2 tube is used and a "C" battery of between 8 and 9 volts. The same "B" battery is used on this step as on the first and is also run through a telephone jack to enable the telephone receivers to be used. I am using the Brandes Navy Type phones although I would prefer the Baldwins if available. The sketch shows the circuit used.

I have been using a method of adjusting, particularly on short waves (200 to 900 or 1000 meters,) which I have never seen explained in print and which seems to me to give good results from the standpoint of selectivity and loudness of signals, also retaining very nearly the natural tone of the spark stations although the detector tube is in full oscillation. When this adjustment is obtained the oscillations in the tube are exactly the same frequency as those in the aerial circuit or of the signal to be received (or if there is some difference in frequency it is so small that the beat notes which would be formed by this difference are of such a low frequency as to be inaudible.) For simplicity's sake and also because I know a great many of you will challenge the accuracy of the above statement I will refer to the adjustment as the location of a

(Continued on page 25)

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Radio Market News Service

Beginning April 15, 1921, the radio market news service of the U. S. Bureau of Markets was expanded to include the sending of agricultural market reports by wireless from Washington, D. C., Bellefonte, Pa., St. Louis and Omaha, at stated periods each business day. This increased radio market news service is made possible by the co-operation of the U. S. Post Office Department which, through its Air Mail Radio Service, has offered to send certain agricultural reports to the Bureau of Markets at specified hours from its wireless stations at the cities named.

On December 15, 1920, the Bureau inaugurated an experimental wireless market news service at Washington for the purpose of determining the practicability of sending daily agricultural market reports to farmers by wireless, as previously announced in QST. Reports of prices and conditions of leading fruits and vegetables, live stock and meats, grain, hay and feed, at important national markets were prepared and at 5 p.m. each day were sent by wireless from the U. S. Bureau of Standards' Washington radio station to farmers and other agricultural interests within a 200-mile radius of Washington. The experiment proved successful and the offer of the Post Office Department to send similar reports from some of its wireless stations was gladly accepted. The sending of reports from Washington which had formerly been handled by the Bureau of Standards was transferred to the Post Office Department on April 5.

The schedule for sending reports is as follows: From Omaha a complete report of the Omaha live-stock market will be sent at 11.15 a.m. each day (Central standard time), and at 11:45 a.m. a complete report on the Kansas City live-stock market. At 2:15 p.m. a grain and potato report, giving prices and conditions at the Chicago, Minneapolis, Kansas City and Winnipeg grain markets, and similar information at the Chicago and other potato markets, will be dispatched. At 5 p.m. a daily "Radio Marketgram" will be sent, covering national market conditions on live stock, fruits and vegetables, grain, hay, feed and seed. The reports to be sent from St. Louis are a National Stock Yards live-stock market report at 11 a.m. (Central standard time), a Chicago live-stock market report at 11:30 a.m., a grain and potato report at 2 p.m., and the Radio Marketgram at 7 p.m. From the Washington and Bellefonte stations will be dispatched a Radio Marketgram giving a general daily summary of eastern market prices on live stock and meats, fruits and vegetables, grain, hay, feed and seed, at 5 p.m. and 7 p.m. respectively, (Eastern standard time). The Weather Reports from the local office of the U. S. Weather Bureau will be appended to the forenoon live-stock report. Any changes in the form or time of reports will be announced in advance by radio at the time of sending regular reports.

These reports are intended to be received by amateur radio operators within the territory covered by the 300-mile radius of each of the four wireless stations named. There are some 2,500 licensed wireless operators in the area covered, and the Bureau of Markets hopes that as many of these operators as can conveniently do so will receive the reports and see that they are placed in the hands of farmers and other agricultural interests as soon as possible after the information is received. The morning and early afternoon reports will be sufficiently brief to be transmitted in 10 or 15 minutes each, and the Radio Marketgram will require about 20 minutes. Each operator indicating a desire to receive and distribute the market reports will be supplied with blank forms so that it will be necessary for him simply to fill in (in longhand) the prices, and the brief comments on general market conditions. With one exception, the reports will be transmitted on a wave length of 800 meters at a rate of 15 words per minute. The Washington station will use an 1800 meter wave length. The reports will be opened by the general call signal to all stations (QST) and the call signals of the Post Office Department: WWX for Washington, WWQ for Bellefonte, KDEL for St. Louis and KDEF for Omaha.

Suggested methods of distributing the reports are: Furnish them at once to shippers' associations, county agents, States bureaus of markets, farm bureaus, and other agricultural organizations; deliver them to local newspapers for publication; post them on the bulletin board in the Post Office or elsewhere; and file them with the local telephone exchange so that farmers can get the information by asking the telephone operator for it. Suggestions for improvement of the service will be welcomed. It is desired that all A.R.R.L. members interested in receiving or planning to receive the reports by radio communicate with the U. S. Bureau of Markets.

SAVE YOUR MONEY!
CHICAGO CONVENTION
AUG. 30—SEPT. 3

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A Cup For Summer Achievement

MR. Seymour Wemyss Smith of "The Hartford Courant", long a member of the A.R.R.L. and likewise of the Radio Club of Hartford and ardently interested in amateur activity, has presented the A.R.R.L. with the handsome loving cup shown in our illustration, to be awarded by the A.R.R.L. to the amateur performing the most outstanding feat in the interest of Citizen Radio, under rules to be drawn up by us.

Mr. S. Kruse has accepted our invitation to become the chairman of a committee to award the cup. He is now forming his crew, to consist of a well-known and representative amateur from each inspection district, he himself representing the Third. The tentative formation of the committee is as follows: Irving Vermilya, 1ZE; C. J. Goette, 2JU; S. Kruse (Chairman), 3ABI; E. H. Merritt, 4YA; J. M. Clayton, 5ZL; A. E. Bessey, 6ZK; Royal Mumford, 7ZJ; Rev. A. J. Manning, 8ZG; R. H. G. Mathews, 9ZN. It has been decided to make the award on November last of this year for the most outstanding accomplishment between July 1st and November 1st. The summer period was chosen purposely, because an achivement made then will be an accomplishment indeed.

The cup stands 13¼ inches high, is the same in overall width, and with a bowl 9¼ inches diameter. Across the face of it is engraved "National Trophy—American Radio Relay League—In Recognition of Outstanding Achievement in the Interest of Citizen Wireless". On the reverse will be engraved the name of the winner and the circumstances under which the award is made. It is a prize well worth having, for the honor that will go with its possession.

The readers of QST are requested to submit to the Chairman of the Committee, Mr. S. Kruse, 2637 Garfield St., N. W., Washington, D. C., any distinctly meritorious work in the advancement or interest of Amateur Radio that should come to their notice. Any type of work whatever will be considered, whether a feat of operating, construction, design, invention, organization, noteworthy publication, or what not. The achievement must be made between July 1st and November 1st, and all suggestions should be in by November 7th.

Who's going to get it? We'd be mighty proud to have it sitting in our static room, proof to the world that we did something noteworthy in the annals of Amateur Radio. The coming of the contest right in midsummer means that you'll have to keep on the job, fellows. Your neighbor will have the edge on you if you don't. We are an organization of Doers and it's going to be no easy matter for the judges to pick a winner, because we're all accustomed, anyway, to work for the advancement of Citizen Wireless. But somebody is going to do something distinctive—something "outstanding". Somebody is going to relay 1100 messages per month right thru summer, or is going to work Japan on a detector tube, or invent something, or put Citizen Wireless to some new use in the



service of the community. We do things that are conspicuous right along, but there's only one cup and the fellow whose accomplishment sticks up head and shoulders above the gang is going to get it, and with it the recognition of service to the game.

So don't dare to give up the set—stick right on the job this summer!

SPARK RECEPTION ON HONEYCOMBS

(*Continued from page 23*)

quiet spot between two noisy spots and leave the proof or discrediting of the above theory to some of you who have a more elaborate testing equipment than I have at my disposal. I presume that this method is practically the same thing that Mr. Groves described in QST some time ago but as I understood the article it applied principally to the longer waves and I believe that somehow he missed the corresponding results that could be obtained on the short waves.

(*Continued on page 32*)

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First National A.R.R.L. Convention

THE First National A.R.R.L. Convention will be held in Chicago August 30th to September 3rd and will be the biggest combined radio show and general good time ever staged. The programs of the various meetings include the very best speakers from all over the country and it is believed that this program is so varied that it will be interesting to everyone. The Convention headquarters will be at the beautiful Edgewater Beach Hotel, situated on the shore of Lake Michigan. This hotel is of the very latest summer resort type and has as its attractions tennis courts, small golf links, swimming and bathing facilities, dancing, private bus service to the downtown district, and a hydroaeroplane taxi service. Registration will be done at this hotel and the offices of the Convention managers will be located there. The Banquet to be held on the final evening of the Convention will be held on the famous beach walk of the Edgewater Beach Hotel and speeches will be delivered from a gondola on the lake by means of loud speakers.

The general meetings, special meetings and manufacturers' exhibit and show will be staged at the Chicago Broadway Armory. This structure is over a block long and a half block wide and is beautifully decorated. The exhibits which will comprise booths furnished by radio manufacturers and dealers all over the country as well as exhibits of the latest Army and Navy equipment will line the walls of this enormous hall. Chair accommodations for over 2,000 are provided in the center of this hall which is provided with a speaker's platform equipped with modern sounding boards. All the big meetings and lectures will be held here, which is a decided advantage to both the Convention delegates and exhibitors as the meetings and exhibits are thus placed close together.

In connection with the meeting and exhibit hall is the well known Butterfly Room which is fitted up as a dance hall and which will be used for executive and traffic department meetings in the daytime. Dancing will be provided in the evening with music furnished by a special orchestra of radio men.

Refreshments will be served in the large lobby adjoining both the exhibit hall and the Butterfly Room.

These details serve to give a very meager idea of the scale on which this biggest of radio conventions is being staged. Every effort is being made to bring together the most notable collection of radio men ever gathered under one roof, and since "all work and no play makes Jack a dull boy" special amusement is being provided by the various trips throughout the city as well as by the cabaret and banquet nights.

The cabaret night which will be held on the fourth evening of the convention will be devoted entirely to a general good time at which we will "take over" one of Chicago's best dinner and dancing places. Every attempt is being made to take good care of the wives and mothers who may accompany our delegates and special trips are being organized to Marshall Field's and several other of the large department stores, which should prove of interest to these fair visitors. For those who come without OW's, girls will be provided for the banquet. This may sound like an impossibility but we can guarantee at least 500 unattached young ladies who are willing to be talked to about radio.

Special rates are being arranged in connection with the various railroads whereby tickets will be certified at Chicago by the Central Division Manager which will allow of a considerable reduction on the return fare.

Preparations are being made to take care of an attendance of over 2,000 radio men and in addition an attendance of thousands of other interested Chicagoans is expected. Reservations for the Banquet and meetings, which will total $5.00 per person, may be made with Mr. N. C. Bos, Reservation Manager, 118 N. La Salle St., Chicago, Ill. In addition to accepting reservations for attendance at the Convention, Mr. Bos will be very glad to supply inquirers with full information regarding hotel rates at the various Chicago hotels and will arrange hotel rooms in advance for any who wish such reservations made. Every effort is being made to get these reservations arranged early. The general tendency, however, is against early reservation because of fear that attendance may not be possible. In this connection it should be stated emphatically that any such reservations made now may be cancelled without question at any time up to and including the day before the Convention. Therefore please do not withhold your reservation because of any doubt as the possibility of your attendance.

At the manufacturers' exhibit, the spaces have been divided to allow booths approximately 14 feet square. The available space aside from that allowed for the meetings has been divided into 31 booths, 6 of which will probably be given over to Army and Navy displays and executive quarters. This leaves but 25 open to the first applicants. The Chief Show Director

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advises that a number of unsolicited requests for space have already been received. Manufacturers and dealers desirous of obtaining space can obtain a chart of the booths, rates and contracts from Mr. N. E. Wunderlich, Show Director, First National A.R.R.L. Convention and Show, 4533 N. Sawyer Ave., Chicago, Ill. General information regarding the entire feature of the Convention, show, programs, or reservations can be obtained from the Central Division Manager, Mr. R. H. G. Mathews, 6433 Ravenswood Ave., Chicago, Ill.

A skeleton outline of the tentative program follows:

August 30th.

Day devoted to meeting arriving delegates, arranging reservations, etc.

7:30 p.m. Business and General Organization Meeting.

August 31st

10:30 a.m. Educational Lectures.
1:30 p.m. Central Division Organization Meeting.
3:30 p.m. General Business Meeting for discussion of interference control, time division, traffic regulations, observance of laws, legislative matters, etc.
7:30 p.m. Technical Meeting on spark apparatus.

September 1st.

10:30 a.m. Educational Lectures.
1:30 p.m. General Club Organization Meeting.
3:30 p.m. General A.R.R.L. Operating Department Meeting, to take action on matters discussed in general business meeting of preceding day.
7:30 p.m. Technical Meeting on C.W. apparatus.

September 2nd.

10:30 a.m. Educational Lectures.
1:00 p.m. Indoor Baseball Game between A.R.R.L. Board of Direction and Chicago Executive Council. Each player will have his call letters printed in large letters on a white placard fastened to his back.
3:00 p.m. A.R.R.L. Board of Direction Meeting.
8:00 p.m. Cabaret—not a meeting but a get-together, free of speeches.

September 3d.

10:30 a.m. Hamfest. All the DX men available will describe their stations, etc.
2:00 p.m. Stunt Party, with novel and interesting tests for which valuable prizes will be given.
8:00 p.m. Banquet and Dance at Edgewater Beach Hotel on the famous Beach Walk.

A Sure-Fire C.W. Circuit

By E. W. Whittier, 1DH *

AFTER trying several C.W. circuits with poor or indifferent results, I happened to run across the hookup shown below, for which credit is due the General Electric Co. The beauty of this circuit is that anyone who can wire up a set correctly can get the maximum output of his tubes with almost no trouble at all. The constants given below have been found to be correct for two UV-202 tubes on several different grounds, aerials, etc.

This article deals mostly with the UV-202 tubes. Since they can be overloaded so easily and safely, we may as well get all we can out of them. The source of plate supply used is an Acme 200 watt C.W. transformer, the output being rectified by an electrolytic rectifier. The output voltage after rectification is between 550-600 V. This means that a high resistance grid leak must be used to keep the grid negative enough to prevent excessive plate current. If the tubes are run on normal plate voltage (350 V.) the grid leak may be omitted. Using from 550 to 600 volts is liable to cause fireworks inside the stem or seal of the tube, and a safety gap connected from the grid of one of the tubes to the filament is recommened. This gap should be about .015 inch (1/64 inch).

The writer runs his two tubes on this high voltage and uses about 150 M.A. plate current. The power put into the antenna circuit is 30 watts under these conditions. The efficiency of the tubes at this overload is about 33%. The antenna current will vary with the conditions of resistance in the antenna and ground system. Using a 14 ohm antenna system 1.5 amperes can be obtained. With a good counterpoise the resistance may be made as low as 5 or 6 ohms, giving an antenna current of 2.2 to 2.5 amperes with the same plate voltage and current.

The circuit diagram and its accompanying legend show the constants of the various pieces of apparatus and exactly how to connect them up to get results.

The only meter that is absolutely needed is the antenna H.W.A. but it is highly

*Radio Engineer, Atlantic Radio Co.

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desirable to have a filament voltmeter and a plate milliammeter.

The only real critical adjustment on the whole set is the value of C_4. If the value of this condenser is not right, the grids may be at such a low negative potential that the plate current may become very great. The value of C_4 is different for each change of T_1.

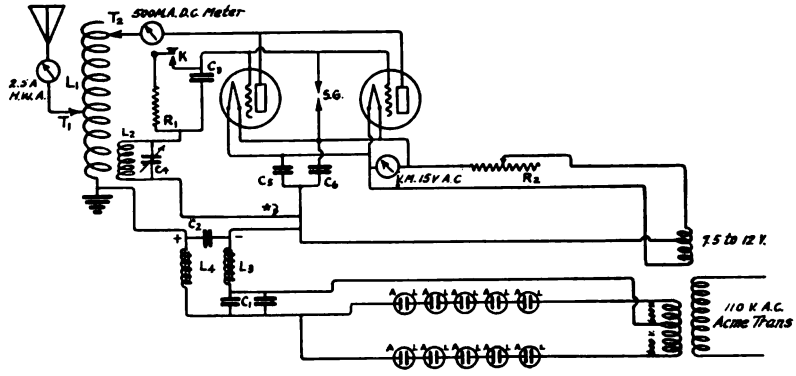
In setting up this circuit, or any other for that matter, the use of as short connecting wires as can be used is always to be recommended. The condensers C_2, C_5, and C_6 should be right in the set and not near the transformer or rectifier. These are high frequency by-pass condensers and should be connected by short leads, and be near the oscillatory circuit.

In setting up the electrolytic rectifier, don't use large plates thinking you will get more voltage or current. If the plates are too large or too small the voltage and the completeness of rectification is affected. The author uses aluminum strips ¼" wide and 3" long and 1/32" thick; these pass 200 M.A. easily. If the plates are wider they should not be immersed so far into the borax solution. A total area of ⅜ sq. in. per 100 M.A. is about right. When these plates are working properly there are little scintillating sparks running all over the immersed portion. The best way to make up the solution for these rectifiers is to dissolve as much 20 Mule Team Borax as possible in cold distilled water. Allow the surplus borax to settle and fill the tumblers containing the lead and aluminum strips with the clean liquid. As the solution evaporates add only distilled water.

It will be noticed that an A.C. voltmeter was used to tell the proper filament brilliancy. This method gives several times as great filament life as the use of an ammeter for this purpose.

This same circuit may be used on UV-203 tubes (50 watt) with slight changes in the constants. The grid leak at 750 volts may be omitted. With 1000 V. on the plates of two UV-203 tubes the grid leak is about 250 ohms; for one tube twice that. The condensers on the filter circuit will have to be able to stand 2000 V. at least. Ten tumblers on each side of the 1500 V. secondary winding of the plate voltage transformer are needed.

The author has been using a small set



L_1—Antenna inductance 25 turns of large wire or edgewise wound copper ribbon about 5 to 6 inches in dia. Well insulated.

L_2—Grid tickler coil 15 turns bell wire on 3 to 4 inch dia. tube and placed in bottom of L_1. Wind in the opposite direction to L_1.

L_3, L_4—1½ henry iron core chokes, 500 M.A. capacity. 150 M.A. will do.

C_1, C_2—21-AA Western Elec. Co. 1 mfd. condensers.

C_3—.0005 to .005 mica or air condenser, fixed.

C_4—.0005 to .001 air condenser (variable)

C_5, C_6—.001 fixed paper condensers.

R_1—Grid leak resistance 10,000 to 15,000 ohms.

R_2—Rheostat capable of carrying 4.7 amperes. (The rheostat may be done away with if the voltage of the transformer is just 7.5 V. when the tubes are lighted. When modulating, the filaments need to be a trifle brighter than for telegraphy.

T_1—Tap to vary wave length of antenna circuit.

T_2—Tap to vary power input to plates of tubes (coupling).

V.M.—0-10 or 0-15 voltmeter.

S.G.—Safety gap.

K—Key.

*Secondary of modulation transformer may be inserted at this point. The secondary of this transformer must be shunted by a .001 condenser or short circuited when using straight C.W. The value of C_4 then will be different when modulating than when using C.W.

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as described (two UV-202's) and has had no trouble working over 800 miles on straight C.W. With voice modulation about 100 miles is the limit when there is no QRM. I wish to thank those who have so kindly reported the signals from 1DH and stand willing to help those who may be in need of any dope on hooking up a C.W. Set.

(Editor's Note—Circuit students will recognize this hook-up as the favorite diagram of the English engineers in their war-time sets. It appears frequently in Stanley's "Valves and Valve Apparatus".

As to the results it gives, it is far and away the best short wave oscillator we have ever tried. Since the receipt of Mr. Whittier's paper at the QST office we have tried this circuit at three different stations, one a phone station using two 50-watt tubes in a Colpitts circuit, one a 5-watt set using the Hartley circuit, and the third an experimental circuit using three E tubes. In every case surprising improvement resulted. These three cases are not enough from which to make a general rule but nevertheless we will state that the new circuit gave outputs that averaged more than twice the watts power given by the original circuits, accompanied by the ability to reduce wave length an average of 100 meters in each of the three sets. The 5-watt set used a UV-202 and with the new circuit, using 850 volts a.c. on the plate, 15 watts were put into an antenna of 500 mmfds. capacity on 190 meters! It works—try it.)

QRX For a New O.W.

By Irving Vermilya, IZE

"SQUEEK, scratch, pick, putter, pfoof, spiff awawk—"

"What the hexx is this," thot old 1HAA, as he tuned around trying to get a line on its decrement. "Something new moved into this little old burg of Marion, I'll bet, or else that sixty cycle stuff is running loose up in some tree top."

All quiet, not a peep or scratch, and VN breathed easier. But we speak too soon, for suddenly the air was again rent asunder, worse than ever, with the darndest scratching and sputtering and up-and-down shimmy tones ever heard. "Sure enough, that's a Ford spark coil or I'm a boob," said VN.

Mad clear thru, he threw the juice on his old stone-crusher and with the bug key gave a quick snappy "QRA?" and listened. Not a scratch to be heard. The usual 2's, 3's and 8's were pounding in but not a sound from the QRM-er. "Just as I thought," said Vermilya; "that bird is sitting there waiting for me to get busy with someone out in Ohio before he murders me with his coil." But after a long period of silence for both the big DX station and the new-born "friend," VN looked in the direction of his message hook and realized there was lots of work to be done. So he started in to clear the hook as quickly as possible.

No more was heard from the new-comer so the night progressed well for DX work. The next day, try as he might, Van could not forget that new noise. Marion is so far from civilization that one coil is a big matter, especially where hundreds of messages are handled each month and a good clear path is essential. Well did 1HAA realize that he already had his hands full with the continual QRM he gets from the high power station not a mile away from his shack radiating four hundred and fifty amperes. Eventually he got to thinking



Miss Eunice Randall.

that perhaps he had imagined a lot of it, but was certain whoever or whatever it was had a pretty broad band of waves.

Next night as he sat in at his tuner, long before touching his key, sure enough that

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was the same old boy at it again. "Scratch, scratch, scratch," on and on it went. "Dog-gone it," said VN, "someone's either going to get a license now or pipe down or I'm going to find the reason why. I'll just take a listen to this and see if old Killjoy will hang himself if I give him plenty of rope." On went the scratch—"Sputt, stitch, futz, buut, fuerer, thup, wee, zipp." "Good



The Y.L. at 1XE.

night," thot VN, what are we coming to?"

Finally all died down again and once more Van put the juice on the old sink gap, and then just ...— ...— and a listen. "That ought to do for bait," thought he. Much to his surprise he heard a very crippled call: "1 H AA 1 H AA ER."

"There now, for the love of mud, we do know that he wants to call himself 'ER' ". So back he went after Mr. ER. He realized it would be useless to give this newcomer a show of speed for surely it would not be appreciated, so he spelled out as slowly as ever he sent, "W h o i s E R p l e a s e."

A long silence, and then, soft and sweet this time, just the simple word "What?" So again: "W h o a r e y o u p l e a s e?" "There, that ought to fetch him," Van thought. And sure enough, like a long slow funeral procession came the following:

"This is a little girl in Mattapoisett and I will see you tomorrow night."

"Wow, said Vermilya to himself. "This is the little innocent chick I've been wanting to hang or kill or something. Wonder if she knows I'm married." A million other thoughts ran thru his mind but he began to realize that this little lady probably wanted an answer of some sort, so he put the switch down, and again very slowly: "I a m m a r r i e d." The answer came back a-flying this time: that is, the reply was quick even tho the sending was not: "How we suffer, but my heart is not in my hand; I will see you tomorrow night just the same."

"OK have your own way."

Thus ended the conversation and no further scratching was heard. But upset! Say, VN was purely and simply licked. Here he was going to "make" someone get a license and the first thing he knew a little girl had come along and he had passed out like a little boy sent to bed without his supper. "Darn her anyway. Gee she's fresh, telling me she is going to see me tomorrow night. I'll be darned if she will. I'm going out to a dance tomorrow night and I'll lock this old coop up tighter than a drum."

Not daring to mention his experience on the air to a soul, next night VN went off to a dance in a neighboring town. Many of his friends were there; all seemed quiet and everthing was going along in fine shape; the music was good and so were the dancers. Now in these small country places strangers are easily spotted, and it wasn't long before Van noticed two very tall people enter the hall—a fellow and a girl, looking much like brother and sister. But as they stopped to speak to Brad Cleveland, an old friend of Van's, he decided they belonged there and that he had just never noticed them before. A little while later VN was sitting alongside of Brad and in the course of the conversation he asked Brad who that tall couple was that had come in a short while before. You could have knocked him over with a feather when he was told that their name was Randall and that the girl was in the wireless business somewhere up Boston way. "Holy smoke," thot VN, "I'll bet my last nickel that that's the one I had on the air!" Here she came, making foot-prints over their way and up jumped Brad saying "Vermilya, I want you to meet Miss Eunice Randall. She is deeply interested in wireless and works up in the American Radio & Research Laboratories at Medford Hillside." VN tried his best to say something but the best he could do was a sound that resembled "MO." "No," said Miss Randall, "you won't need your direction finder now; you can put it away. I have found you and met you as I promised I would do last night. I've heard about enough about 1HAA without knowing him, especially when you consider that my home is in Mattapoisett, only about five miles from your station. While I don't live there dur-

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ing the week, I manage to get down week-ends once in a while. I am working up in the Amrad place as draftlady and now, to be truthful with you, I want to learn the code and theory of radio so I can be 'one of the boys' ".

"Look here, Miss Randall, if you are in earnest and really want to learn the code and all about radio from one end to the other, I will help you all I can. But if you just want an adventure you're going to be plain Outta Luck. Now which is it?"

"I tell you I am really interested and if you had seen me shinning up a tree putting my aerial in place you would believe me a lady of my word"

"Very well," said VN, "I'll give you a note to a good friend of mine who runs a radio school in Boston, where you can learn in a good thoro manner all the ins and outs of radio, as well as code. You're going to have a mighty hard struggle, I can warn you, and being a girl your trials will be many and hard, but I want you to know I admire your grit and nerve and I can see right now that you are going to succeed. When you come out, bring a first grade commercial license with you and then if you're not too busy let me know how you liked it all and whether you think that after getting that far and being thoroly bitten by the little radio bug you will ever waste any more time thinking of the things that most other girls think about. You're one in a hundred for the pick you are taking and I want to wish you success. But meanwhile please don't open up on that squeak box again until you can handle at least fifteen words per minute. By that time you will be an honest dyed-in-the-wool O. W., and believe me if you make good I'll see that you have a station that will put Mattapoisett on the map."

"Gosh," thot Vn, "she isn't so bad after all. In fact I'll have to take my hat off to her. She has the proper spirit for a real honest to goodness shemale radio bug. Other districts have had the honor of boasting an O.W. long enough, by heck; we're going to have one of our own up here now."

So watch your step, boys, for already she is on the job at 1XE every night they have the radiophone concerts—yes, she's the assistant operator at 1XE. And on three other nights a week she's plugging away at code at a Boston school where reports say she is already doing better than some of the fellows that have been there six weeks longer than she. And it won't be long now before you'll hear another real DX station on the air and the operator is going to be Miss Eunice Randall.

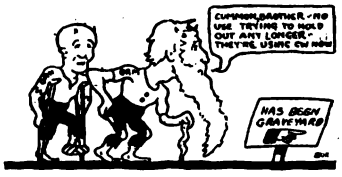
As a word of warning, don't try to flirt with her, for she hasn't time and besides, as she has already asserted, she "does not carry her heart in her hand." Treat her as one of us, a sister operator. If you can lend her encouragement by all means do so as she's the jolliest girl you ever want to meet or talk with over the air. But don't expect to find a "little" girl, for Miss Randall is over six feet tall.

Three cheers for the new First District O.W.!

All Set to Perforate QRN!

A Midsummer Party to which Everyone is Invited

WE are off, and we are loaded for bear and lordhelpus if we don't knock Old Man Static full of holes in our static-puncturing contest on the night of July 19th. This was announced in June QST, page 21. Come on and unpack your receivers, you fellows who have closed up for the summer; dust 'em off and give our A.R.R.L. a lift. We need you, OM. We need everyone if we are to be successful in the undertaking. This is the first time such a contest has been attempted in mid-summer, and we want to prove that relaying can be done with C.W. thru QRN, and we are calling upon you men who can copy thru static. There will be a hole in static all right and C.W. will puncture some more holes—copy thru them. The scheme is to have pairs of transmitters broadcast messages as per the following schedule on July 19th. Each pair of transmitters will consist of the most powerful C.W. and spark in each division of the A.R.R.L. Each transmitter will broadcast a different message at ten words per minute and each message will be sent twice.



It is a well known fact that it is rather hard to pick up the C.W. signals, so on July 16th each of the transmitters will QRL at exactly the same time and exactly the same wave as shown on the schedule. This will give all of you a chance to tune

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for the different transmitters and make notes of the settings of your receiving equipment. In this way it will not be necessary for you to "hunt" for the transmitters on July 19th, because you can be reasonably sure of finding the stations on the same adjustments. There will be 38 transmitters, 18 C.W. and 20 spark, scattered all over the United States and Canada, and if you have any kind of receiver at all and can copy thru QRN, you ought to make some good records. (Undoubtedly there will be many stations heard over great distances where they have not been heard before. We will have authentic proof if new records are made and due credit will be given the receiving operator for his part in copying.) All transmitters have been instructed to start promptly on schedule, and not to start 5 seconds before or 5 seconds after the scheduled time and not to overlap by even 1 second. The schedule is on Eastern Standard Time. Now your part will be to copy—copy any part or all of every message from every C.W. and spark station. You must have the signature of two people who witness the actual reception of the messages and these signatures must appear on the original copy that is sent to this office for verification. Remember that you will be given due credit for any part of any message that you copy, so do not feel discouraged if you do not get a perfect copy—send in what you do copy. While accuracy and completeness of copy will be considered in computing the percentages, the main feature in determining the winner is based on the grand total of air line miles over which distances the messages travel in order to be received at your station. Therefore it will be necessary for you to note the distances of the transmitters from your station on each message. After all the transmitters have finished the broadcast, add the total mileage of the C.W. stations and the total mileage of the spark stations. Then add these two figures which will give you a grand total. Mail your copies to the American Radio Relay League, 1045 Main St., Hartford, Conn., so as to reach this office not later than July 26th.

If you are not interested in the contest, please have a heart and keep your transmitter silent during the transmitting period so the thousands of other amateurs can copy. We will have QRN, and we can but put holes in that, but please let us have your co-operation in a way that will reduce QRM to the very minimum, and accept our thanks for your efforts in asking others to do the same.

Schedule of Transmitters for the Static-Puncturing Contest, July 16th and 19th.

Eastern Standard Time, P.M.

Division	C.W.	Wave	Time	Spark	Wave	Time
Ontario	9AL*	250	8:46	3BP*	200	8:50
New England	1AE	275	8:54	1ZE	250	8:58
New England	1TS	275	9:02	1AW	200	9:06
Atlantic	2ZL	275	9:10	2JU	200	9:14
Atlantic	3AAO	280	9:18	3XF	375	9:22
Roanoke	8ZW	325	9:26	8SP	200	9:30
East Gulf	4GL	220	9:34	4XC	375	9:38
Delta	——	——	——	5ZP	250	9:42
Delta	——	——	——	5ZL	300	9:46
Midwest	9HT	200	9:50	9OE	200	10:02
Midwest	9ZB	375	10:06	9LC	200	10:10
Central	8IB	200	10:14	9ZN	375	10:18
Central	8DE	210	10:22	8ZL	375	10:26
Dakota	9XI	360	10:30	9ZX	375	10:34
West Gulf	5ZA	375	10:38	5ZX	375	10:42
West Gulf	5ZW	375	10:46	5ZC	375	10:50
Rocky Mountain	6WV	375	10:54	6JT	200	10:58
Pacific	6ZX	375	11:02	6OH	200	11:06
Pacific	6EN	200	11:10	6ZO	375	11:14
Northwestern	7XF	250	11:18	7DA	200	11:22

*Canadian

SPARK RECEPTION ON HONEYCOMBS

(*Continued from page 25*)

[Editor's Note—What Mr. Kinyon uses is "zero beat frequency." The tube is really in full oscillation but at the same frequency as the incoming signals, so that no beat note is produced. In such adjustment the full benefit of heterodyne amplification is received on spark signals and without distortion of the musical note. It is well worth the somewhat critical adjustment necessary to secure it.

In the concluding installment of this article, in our next issue, Mr. Kinyon will tell just how he adjusts his equipment for best results.].

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EDITORIALS
de AMERICAN RADIO RELAY LEAGUE



What We Want in Radio Law

THE scheme of the two radio bills introduced in the House by Congressman White and in the Senate by Senator Kellogg at the instance of the Department of Commerce is to get away from outlining operating regulations in the law and instead provide a law that will establish an administrative organization and facilities for publishing regulations from time to time, so that the regulations can be changed as progress in the art demands without the necessity of framing a new law every few years. As we stated in these columns last month, our Board of Direction after a careful consideration of the case feels that the province of the amateur ought to be specified in the law. Some folks, we suppose, will think we are highly inconsistent in asking for what offhand seems to be a request for direct discrimination in our favor. But is it? We do not think so.

These bills would provide for the government of all classes of stations by regulations promulgated as occasion required, by the Secretary of Commerce. Now the present Secretary and the present Commissioner of Navigation and the present Chief Radio Inspector are all friendly towards the amateur and know his value, and we haven't any doubt that administration of such a law by them would be entirely satisfactory to us amateurs. But they won't be in office always, and we ask you to just imagine a Daniels as head of the department looking after us! We wouldn't be safe, and as now is the time to express ourselves for future years we are doing so. While we amateurs are well organized for looking after our interests in general, we are not financially equipped to wage a continual defensive against powerful commercial or political interests that might want to invade our little domain for some purpose of theirs. We feel very strongly that the only reason we have been unmolested in past years is that the law has very definitely said that there shall be amateurs and that their wave shall be up to 200 meters. As a class we are not prepared to combat big interests perpetually and our only safeguard is to get our future written into the law. And as we pointed out last month, commercial companies won't put good money into installations to use waves near the amateur's as long as there is possibility that the latter may be changed to interfere with them; yet the intensive development of radio demands that use be made of all waves, so that definitely specifying ours in the law should stabilize the commercial use of nearby waves. An exception to this end in the case of the amateur would not be terribly inconsistent, since we are at about one end of the waves of value so that we could be put to one side and the use of all other waves left to regulation without disrupting the scheme.

And it's vital that no drastic change be made in our allocation. Our apparatus is extremely highly specialized and would be made virtual junk if we were suddenly given a wave length appreciably different from our present. And our investment in equipment runs up into many millions of dollars.

We have another thing in our favor in the very consideration of what wave lengths we should ask for. The Department of Commerce had a committee last year consisting of representatives from every radio interest in the country and they gave consideration to what wave length the amateur should have in new law. The old basis wouldn't do, for the navy want a wave under ours for chaser boats, and yet we couldn't be put up too high because the ship-to-shore telephone service wants waves around 300. They had many meetings but eventually a tenable basis was arrived at, with every interest agreeing that they would be satisfied if such waves were assigned the amateur. Broadly speaking they are 180 to 220 meters for spark, and 180 to 250 for C.W. If an unwise administration should assign waves other than the above to us amateurs as long as present conditions in the art maintain, they would certainly be stepping on the toes of one or more strong interests, yet the above wave lengths form a basis that has been mutually agreed to. And with the Navy below us and the A.T.&T. above us, both clamoring for more room, believe us we would like to see our wave length written into the law so that there would be no question about it.

These, then, are the reasons why we are asking our friends, the Department of Commerce, to amend their new bills to except the amateur and write his place into the law in black and white.

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What We Are.

THE A.R.R.L. used to be just a little handful of ardent enthusiasts, but that was long ago and now we are a big national organization, recognized as the standard-bearers wherever amateur affairs are concerned. Recently we told of losing our goat to a chap we ran across who had never heard of our A.R.R.L., but altho such birds are rare it is not unusual for us to discover that apparently well-informed amateurs have no knowledge of what we are or why we exist. When they got into the game they heard of the A.R.R.L., liked what they saw of it and joined, largely perhaps because everybody else they knew belonged. As time passed they heard of our relay work and got a place in it, and they see and perhaps like some of the other tnings we do. But the Big Idea often never gets thru to them.

The A.R.R.L. is an organization of amateurs, and every official in it is likewise an amateur. From its very inception it has been non-commercial, its originators being amateurs with no axes to grind and clearly realizing that there could be no successful organization unless it be co-operative. The phase in which the non-radio public best knows us is as relayers, but we are much more than that. We *are* the amateurs and the writer of these poor lines is likewise an amateur. QST is our magazine and thru it we bind ourselves closer and accomplish things together, but QST is incidental to the League and simply does its best as the A.R.R.L.'s mouthpiece to further things "of, by and for the amateur."

Offhand we know no parallel to our organization. Always we have steered a careful course among the rocks of commercialism and personal ambition, and today we truly have a great big national self-governing institution which is a leader in amateur thought. We stand for observance of the law and for scientific progress. Our union makes possible many things of co-operative benefit: our relaying, our ability to speak as a solid body when dangerous legislation threatens, the many things of national breadth which we undertake. Almost every amateur of any prominence belongs to our League and so, as we *are* the amateurs and incapable of becoming a body to merely exploit the amateur, we are recognized as the leaders, the body politic in the amateur world.

From these things and based upon them there has come into existence a wonderful spirit—the A.R.R.L. spirit. There *is* a clean organization of the amateurs themselves, whose interests are those of its individual members, and with a feeling akin to amazement amateurs have realized this and come into our ranks. Look at our Operating Department, with almost four hundred officials serving without compensation, grinding out letters, perfecting their network, inspired by the common cause and safe in the knowledge that they're not being "exploited"—realizing, in fact, that the A.R.R.L. is *they themselves*. Consider the official relay stations, the fading test recorders, the membership of our Board of Direction, the affiliation of some two hundred clubs—all of us imbued with the same wonderful spirit and working together in the advancement of a thing we all love, Amateur Radio. That's what it means to belong to the A.R.R.L.

This Word "Citizen"

YOU'VE seen it—we use it frequently in these columns. Some folks seem to object to it, mostly because there isn't anything the matter with the word "amateur" while "citizen" brings up to them visions of soviets, Citizen Bessey and Citizen Galyean and so on, red flags and parlor Bolshevism, etc.

Now there's nothing the matter with the good old word "amateur." It correctly defines what we are, and implies a good clean sport. In sports it has always been unfortunate to lose one's amateur status, and likewise in these days the word rarely carries any stigma of inefficiency or clumsiness but generally quite the contrary. It means something definite and pleasing, and is the word under which we have our rights in the law.

On the other hand we are trying to get away from the idea that our radio is a plaything, and establish before the general public the fact that serious communication is being accomplished by private citizens. Do you realize that our radio provides about the only way by which an individual can communicate intelligence to another beyond the sound of his own voice without paying tribute to a government or a commercial interest? It's so, and it's a big thing and becoming increasingly important as new-comers enter the game. Simply to use a word implying that we love our sport and are skillful at it does not seem enough to us. When we speak of "Citizen Wireless" we convey a picture—no longer of little boys in short trousers playing with toys, no longer of eccentric dabblers, but of a vast field in which the private citizen of this country may enter and carry on useful communication. And when we stand up before a Congressional committee it's a good term too—just think exactly what it means!

So there're things to be said both pro and con and the subject is by no means a closed one. While we like the expression "Citizen Wireless" because it implies perhaps a more serious effort than the word "amateur", we're not abandoning the latter nor endeavoring to foist the former where it may be distasteful. Let's talk about it a little in QST—just what do we think about the matter?

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The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



C.W. is fast supplanting the spark transmitter, and while this change is being made our message traffic is suffering. For the month of May a total of 6,699 messages is reported as against 10,532 for the month of April. A drop of about 37%, but as soon as a few more good C.W. stations come to the front our traffic will climb very rapidly.

The New England Division is honored for the third time in succession with the star station in traffic handling, and this month 1ZE (formerly 1HAA) must take second place to 1CK, who handles messages at a terrific speed and can be heard at 30 per 'most any night. F.B., Robinson.

MR. P. F. ROBINSON, 1CK
Braintree, Mass.
412 Messages
New England Division

There is no use trying to dodge the issue. C.W. is here to stay and unless we are afflicted with a foggy brain, C.W. will be so far ahead of the spark that messages of unimportance will be left for that means of communication, while the messages of more importance will go via C.W., because they will get thru. And even when the "rock-crusher" at 9ZN is thrown into the discard, we will not be surprised, and all of you know what Matty thinks of a good spark. However, glance thru the Central Division report and note that communication is maintained with C.W. while the spark stations have given up in despair. On the other hand we point out to you the work being done by 2ZL, 4GL, 3AAO, and 1TS, all of which are C.W. stations. The spark set at 2ZL was junked so long ago that not even a punctured condenser remains. And 2ZL moves messages in groups of 5 and 10 almost every night regardless of QRN, providing of course that other stations are on the job. The only good reason that we can give for your not hearing the hundreds of C.W. stations is because you do not listen nor tune properly for them. Spare the key some night and just listen for C.W. stations. We will venture a guess that you will be astonished at the goodly number you hear, and upon inquiry you will find most of them using less than 50 watts. And notice how the C.W. signals just cut right thru static.



Considerable activity in the Roanoke Division is the changing over of transmitters. The spark is going out while the C.W. is coming in. And that absence of signals from the Delta Division is caused by old man QRN. In other words they have no C.W. stations with which to carry on communication in the division. How about it, Jawn; when can we expect to hear your C.W. sigs?

Reports from the Pacific and Midwest Divisions are missing. The other reports follow:

NEW ENGLAND DIVISION

G. R. Entwistle, Mgr.

Conditions for DX work have been bad lately, due to QRN, aurora, etc. The spark stations seem to be affected more than C.W. Organization is one of the activities taking the most time at present. Especially is this true in Boston, where the newly formed Boston Executive Council is endeavoring to bring all classes of radio amateurs into a closely allied body.

The Boston Executive Council has secured the co-operation of the Army, Navy, A.R.R.L., Department of Commerce and commercial interests. The Council has adopted the Chicago Plan by revising it to the needs of Boston.

The Police Departments in Boston, Hartford and Lowell are co-operating with the amateurs in the transmission of reports of stolen automobiles and any other information through which the public may help them.

A.D.M. Robinson (1CK) reports a new radio station in Lowell, 1LZ, who we expect to help in a route through central New England. 1HAA has been comparatively quiet this month, handling only 304 mes-

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sages. Part of this slump was due to bad weather and the rest to lack of pep in his non-synchronous. 1HAA is now installing a 500 cycle quenched spark set to operate on a special, 1ZE. 1ZE will have three working waves, 200, 250, 375 meters. D.S. Johnson (1DY) must have a job. He is not heard on the key much lately. 1MAD of Pawtucket, R. I., is another comer. He has a 1KW spark set and promises to be a help to DX work. 1CF, 1UN and 1DH are making a lot of noise on C.W. 1XE and 1QR are working fine concerts nearly every evening

D.S. McLean (1JQ) reports conditions between Springfield and Boston are improving only slightly. Southbridge does not seem able to get in communication with Springfield as yet due to a tremendous amount of QRM caused by high tension wires near that station. 1GY signals fade badly. Springfield finds it more satisfactory to work with Boston. 1WR comes through QSA and if not too much QRM can handle traffic through him. Recently 1XM and 1QR have been coming through QSA. In a short time we will have a station in operation on C.W. at Warren, Mass., N. B. Judkins, 1PM, formerly of East Providence. This station will be half way between Springfield and Worcester, and there is no doubt but that traffic can be handled through in fine shape.



In regard to Albany: We find many stations en route to Albany—1KBO at Easthampton, Pittsfield Boys Club at Pittsfield, and other stations in between points, —so that by fall this route will be well organized.

By the next issue of QST we will be able to outline a route north and east of stations not more than 25 miles apart that will make it possible to handle traffic under all conditions. At the present time 1CCY, 1UAV and 1JQ are handling all Springfield traffic including police reports.

A.D.M. Castner (1UQ) of Portland, attended the banquet of the C.W. Club of Boston and reported C.W. increasing in his district.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Reported by A. S. Clarke, Traffic Assistant.

C.W. is taking this division by storm. From all parts come reports of C.W. sets being built and when fall opens up practically everybody will have some sort of C.W. set. Remodelling of sets, addition of new equipment and general preparation for better work next fall is the order of the day. Static has been so severe that the number of messages handled shows a decrease. C.W. seems to be the only thing that cuts through the terrific QRN.

The Division Manager is planning a complete re-organization of the division with several new appointments to be made.

D.S. Wohlford reports that 3BBE at Catawba has his transmitter in good shape and is working Roanoke regularly. A new station is reported in Lexington, Va., and one also at Salem. The Virginia Polytechnic Institute at Blacksburg will have three 1KW outfits.

A.D.S. Higgins will operate a set in Galax instead of Oldtown. A.D.S. Gundry at Stonega reports communication established with Bristol and is trying to connect up to 5DA. 3GO at Norfolk is undergoing a complete remodelling and when the season opens up, will have spark and high powered C.W. and phone, 3EN, city manager White of Norfolk, is putting in 15 watt C.W., also 3VV. 3ACT is handling his share of relay traffic, in spite of QRN, and is installing C.W. 3ACE, 3ACK and 3ACZ are reaching out but static has prevented much traffic being handled. The terrible QRM from NAM is being worked on but still remains the champion nuisance of the district.

The situation in Charlotte, N. C., remains about the same, with several C.W. sets in course of construction. A new 1KW set is in prospect at Asheville, N. C., also a C.W. set. 3BZ and 3AEV are both installing C.W. sets.

No report from D.S. Heck of West Virginia, but 8SP's spark is still heard so we know that traffic is being handled in that section.

No report received from Blair of Richmond. It is regrettable that of the 60 some stations in Richmond no one seems to be interested in DX relay work. They seem to be entirely contented to sit down and talk among themselves and call the neighbors in to listen to KDKA's music and news.

Although static will prevent the usual amount of relay work, there is no slackening of interest or laying down on the job in this division. Everybody is working and planning for the biggest season of all next fall and winter. So look out for the sparks and C.W. of the Roanoke Division when Old Man Static goes to sleep again.

Reported messages, 100.

EAST GULF DIVISION

E. H. Merritt, Mgr.

Practically all work reported this month has been accomplished by blasting thru QRN, as we have had a liberal supply on hand every night now for nearly two

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months. There is a fine spirit being shown by the fellows still hammering away and actually getting thru where it appears to be impossible. The fact that everyone is rebuilding and getting ready for the fall season makes us believe that the East Gulf is going to show up some of the other divisions too. F.B., fellows.

4EG of Woodruff, S. C., reports that he has at last been able to reach out and connect a few DX stations. He says prospects for improvement in S. C. are good, stations in Greenville, Greenwood and Gaffney all trying to get started. This is the first real good news received about S. C. and it is about time we had a few good stations in the state.

D.S. McIlvaine reports that all Alabama stations were hard hit by storms during the month, practically every antenna in tne state being blown down except at 5XA. Carrie, of Montgomery, had his antenna destroyed by lightning but other damage was not severe. 5JO in Birmingham has installed a radiophone and will have it ready next fall. The radio club in Mobile is progressing nicely. The chief operator at NGT is giving them instructive talks and assisting with their sets.

In Florida we are going to lose a couple of good men, 4AM and 4DL. 4DL will return next fall but 4AM is moving to Ohio. We are sorry to lose him from the East Gulf but know he will make a good man for the Central Division. 4AM was one of the first to help open the Florida route for traffic.

4ZN has been held up a long time trying to find a condenser that will hold up under his "coffin". He has moved his station to a better location.

Near Jacksonville, the Lybeck Ocean Harvester Co. has installed a radiophone and is experimenting with their fishing boat, using 350 meters. Anyone hearing "LOH" (temporary) on fone please write J. S. Chapman care of the company at Lybeck, Fla.

D.S. Benning of Georgia has little to report except that about half of Atlanta has been bitten by the C.W. bug. The Atlanta Radio Club has adopted the Chicago plan to control QRM. They are also getting all local stations down to 200 meters. 4AU, 4BT and 4XC recently made a week-end visit to 4BQ. They report that with his new apparatus and remodeled station 4BQ should be the best station in the south. 4BQ reports that a radio club has been formed in Cartersville, Ga.

4BK has instaled a 1KW now, and has otherwise improved his set. 4DV in Columbus is still working on his set and has already connected with several DX stations. 4CU in Jackson, Ga., is heard occasionally. 4AG reports that QRN has held him almost helpless for two months. He is also improving his set and getting ready for better weather. 4DT in La Grange, Ga., has busted loose with a good station and has taken a big hand in handling traffic this month. 4GL in Savannah is blasting thru QRN almost anytime with his C.W. Mr. Hill has about the best C.W. set in the Division but several others have promised to make him hustle to keep it the best. Let's hear more from C.W. men in the East Gulf.

Reported messages, 198. Busiest station, 4FD, 58.

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

The severe static of April and May has reduced traffic work throughout the greater portion of the Division. This is especially true of those routes depending entirely on spark transmitters. Apparently the use of C.W. is a solution of consistent summer work and accordingly strenuous efforts are being made throughout the Division to form and put in operation such routes. The District of Eastern Ohio is especially active in this respect and we believe that satisfactorily and consistently operating routes will soon be in existence connecting Ohio with both the east and west by daylight with all parts of the country.

Mr. and Mrs. Chas. Candler, D.S. of the Miami Valley District of Ohio, report message work decreased considerably, due to the season and the fact that part of the stations were out of commission. 8ZL and 8FT were out of commission for all but a few days during the month. 8FT is now ready again, but 8ZL will be out for some time longer. Other stations in the district were considerably handicapped by having to find outlets for their traffic other than 8ZL and 8FT on whom they had largely depended.

Cincinnati seems to have fallen back into her old rut of keeping by herself rather than co-operate with the rest of the district. The personnel there never send in any report, either general or traffic.

Two newcomers from Dayton, 8AJB and 8AEE, sent in good reports this month and are to be commended for their good work. 8AWU and 8ANY are handling Xenia traffic in good shape, and a station is starting at London, O. 8AEY at Lebanon is beginning to work more regularly and comes in handy to link up with Cincinnati. Nothing more has been heard from Circleville or Chillicothe.

It is regretted that so many stations fail to send in reports. Not half of the stations do so and many of those that are left out do good work and are among the most active in handling traffic. These include the entire number in Cincinnati, 8AEY at Lebanon, 8HG and 8JB at Columbus, 8TN at Dayton and many others. I should like through the columns of QST

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to request that all stations in the Miami Valley District who are interested in or take part in relay work, get in touch with 8ZL and ask for appointments. Many of these stations could be used as alternates in routes already established and others could link up in new routes.

J. Warren Wright has been appointed City Manager of Springfield. He has recently received a special license and his station call has been changed from 8DC to 8ZAA.

All messages sent by 8IB and 8IV this month were transmitted on C.W. and buzzer modulated sets. A small portion of the work at 8ZL last month has also been done by radiophone.

Mr. K. A. Duerk, 8ZY, D.S., Toledo District of Ohio, reports that in this district most of the good DX relay stations are either closed down or, due to the poor relay weather, not operating very much. 8ZR has been heard only a few times. 8KP is temporarily out again, due to burned out transformer. All Detroit and Michigan traffic gets off in good shape, being sent through 8LV at Ann Arbor. Eastern Ohio traffic has not been going quite as promptly as in the last few months, because of the standbys, 8ZN and 8ZR, not being on as much as usual. We don't know the cause of this at 8ZR as they have a half dozen operators, unless it would be that QRN has them scared out. At 8ZN, Mr. Kauffman attends college at Pittsburgh, and Mr. Preston's work has kept him busy, so that he has not been able to devote as much time to operating as formerly. The north-eastern part of the district has not been developed like it should have been. There seems to be a lack of interest in real relaying. Accordingly, to stimulate development in that part of the District, Mr. James P. Turner, of 8AKM, 681 George St., Clyde, Ohio, has been appointed Assistant District Superintendent, having charge over the counties of Wood, Ottawa, Sandusky, Seneca, Huron, Erie, and Lorain. These counties are now out of 8ZN's jurisdiction. Mr. Turner is a wide-awake radio man, and has offered to do his best in getting that part of Ohio lined up. He states that he can cover that territory with his car, and see the operators personally. Upon Mr. Kauffman's recommendation Mr. Ulmer, of 8AJK, has been appointed C.M. of Bucyrus, Ohio.

Mr. J. A. Kolb, 9OX, D.S. of Kentucky, reports that due to the heavy QRN very little work has been done. The number of amateur radio stations is rapidly increasing in this district. Formerly the amateurs were satisfied to work locally but after seeing the results achieved by 9OX, they speak only of DX.

9VZ, Covington, is having trouble with his aerial and condenser, hence his DX is curtailed; 9IO has a C.W. set going and is reaching out; 9UH, Newport, the star DX station of Kentucky, continues to do very good work; 9OX, Louisville, will dismantle and install at a new location.

Mr. Hutchinson, A.D.S. for Northern Indiana, advises of a very meagre report from Ft. Wayne, yet it would be supposed from the number of stations there that there should be much more reported. No South Bend stations have been heard during the month. Are they all dead? It seems that from the number of aerials which the A.D.S. has seen there should be at least one active station in the city.

9ME is again on the air and comes in louder than ever. 9DF, Angola, is rebuilding his receiving set. 9DBQ, Stroh, is again back on the air. 9HR, Middlebury, Ind., has re-installed his transmitter, more than doubled his radiation, and with a new short wave regenerative set and two-step amp. has things in fine shape. The A.D.S. is ready for the summer relay season. 9HR has been getting in to Chicago regularly. 9ALY, Goshen, Ind., has just installed a new and much higher aerial, and a new short wave set preparatory to jumping into the summer relay game. 9FS, Goshen, Ind., has installed a new short wave regenerative set and is all set for summer work. 9FS has been doing exceptional DX work, being on the job practically constantly, and proves a valuable station to the district 9FG, Goshen, Ind., is on the job very little.

9AZX, at Jonesboro, Ind., has installed a 3 tube C.W. set and comes in very QSA at all points in the district. He will prove valuable in handling traffic to Indianapolis. 9AUC, at Albany, Ind., has offered his assistance in handling southern and western traffic. Prospects in the District are very bright for summer work and the A.D.S. will do all in his power to see that things get into good working order.

The station at Purdue University has been in operation regularly throughout

Howard H. Moore,

9FV, A.R.R.L. District Superintendent for Northern Indiana, passed from this life at his home in Elkhart on May 28th, after an illness of many months.

Mr. Moore was always one of the Central Division's best men and a strong A.R.R.L. booster. He made a good district out of Northern Indiana with almost nothing to work with, and his interest and loyalty to his work is attested by the fact that during his last two months he handled his district activities and made his reports from his sick bed.

Truly here was A.R.R.L. spirit, and in the passage of 9FV to a land where signals never fade we have lost a faithful friend and co-worker in the cause of Amateur Radio.

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the past month.

9YB has been doing some pretty good work.

9UJ at Rensselaer, Ind., has some new equipment and is coming in pretty well. He will make a pretty good outlet to Hammond and Gary when he gets a little more experience in operating.

Mr. Burhop of the Wisconsin District states that many of his stations did not submit reports for April. 9TO of Antigo, who hasn't had very much success with his ½, is expecting to put in a 1 KW United Wireless transformer.

The Fox River Valley bunch, Neenah, Menaha, Appleton, and Oshkosh, are expecting to organize an executive council and hold joint meetings. The Oshkosh Radio Club is starting the movement. M. C. Lapp, of the Ann Arbor Fleet, has put up a 1 KW station at his home at Plymouth. His call is 9DLX, and he has been extremely successful in DX work. 9ACM, of Sheboygan, has installed a 1 KW transmitter and added two steps to his regenerative receiver and is helping out great. 9DNL and 9DMU of Manitowoc with ½ KW transmitters and regenerative receivers are in shape to help 9ZL.

Mr. C. E. Darr, D.S. of Michigan, reports: this state is rapidly falling in step with the others in becoming CW-ized. 8KM, 8BO, 8OJ, 8ADY, 8LV and 8ZZ all have C.W. sets that are doing good consistent work and are in close touch with the DX Ohio stations in daylight. A daylight route exists from Detroit to Grand Rapids. Detroit can now work Cleveland in daytime on 5 watts C.W., a thing that never could be done on spark even at night so we have reasons to feel elated over C.W. Traffic (DX) has fallen off somewhat but we are rather busy with interstate traffic.

The Cleveland Radio Association has formed traffic regulations which are being put into effect with excellent results. These regulations are as follows:

8:00 A.M. to 7:00 P.M. Free Air. If possible, confine testing to 6:00 to 7:00 P.M.

7:00 P.M. to 10:00 P.M. Local work only, 50-mile radius. One-quarter kilowatt limit.

10:00 P.M. to 11:30 P.M. Long Distance tryout. No. local work.

11:30 P.M. to 8:00 A.M. Long Distance A.R.R.L. message work only. No Conversation.

Stations operating up to 11:30 P.M. will cease work at that time. Work only one long distance period.

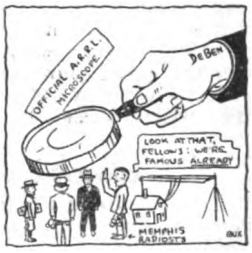
Reported messages, 2444.

DELTA DIVISION

J. M. Clayton, Mgr.

Due to the few good nights for radio, the amount of traffic heandled thru the division for the month has been exceedingly small. From now on till September or October it's a case of relaying via Uncle Sam's relay whenever any stray messages come wandering thru.

5ZP has been forced to take a vacation on account of bum health, and is spending most of his time in bed right now. Where there's life there's hope, tho, and we all know that such a natively strong chap as ZP is, will pull thru in fine shape and we also know he will be back at the set as soon as he can.



Hutcheson, 5DA, D.S. of Tennessee, reports several new stations being installed in that state. There has just been a station completed at Chattanooga. Knoxville boasts of six DX stations now. Mr. M. M. Roddey of Cleveland, Tenn., is putting in a 100 watt C.W. station, and 5ER of Nashville threatens to do the same thing.

5ZAC, ex 5EA at Baton Rouge hasn't been heard from for several months. Evidently Barrow has decided to let QRN down him 'way too early in the year.

5ZAB, Pullen, of Houma, La., had a little aerial trouble when their main pole was blown down in a storm. They have decided to start rebuilding their station for next season.

5YH is still on the job, quite busy right now trying to get the howls out of a new three step short wave regenerative receiver. Captain Baldwin quits tearing off the tinfoil he has pasted on the back of the panel, as a capacity shield, every now and then to handle a lil traffic. However, there have been comparatively few nights this month in which it has been possible to even copy DX stations thru QRN.

No report received from Mississippi. We suppose that Prof. Kennon at 5YE has been too busy with school work.

DeBen, A.D.M., contributed a notable piece of work to the art of relaying when he discovered not only a RADIO station in Memphis, Tenn., but a whole nest full of hams in a radio club there. How he ever located 'em is beyond us. We have been longing for ONE real station in Memphis ever since the days of T. J. M. Daly of 5AK who used to be Thordarson's record-buster in the days of 825 miles on galena night after night.

5ZK is leaving Franklinton for the summer months as he is planing to take an auto trip up to Canada.

No report from Anthony of Shreveport.

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The last time we heard Willie on radio, he was giving the natives an exhibition of the whys and wherefores of radio at some County Fair at Shreveport. That was way late in the wee hours of morn so we guess Willie has been going to bed early ever after to make up for lost sleep.

5JD of Little Rock has been on the set very little this month, mostly due to QRN being too bad to do much good consistent work. Kinsolving is going to blossom out next season with a "sink" gap and all that. If this whole Delta Division ever opens up all at once next season the air will be full of nothing but sink gaps.

We have a new station at Thibodaux, La., 5YL, which looks like it will be a corker.

DAKOTA DIVISION

Boyd Phelps, Mgr.

Relaying has dropped off considerably during the past month. OM Static is taking a whack at the ether and traffic has been reduced to almost nothing. In the month of May sun spots and Aurora Borealis played havoc with both wire and wireless. This discouraging stunt of nature has caused most of the best DX stations to be out, either for repairs or for their owners to catch up on sleep lost during the past season. Either excuse is somewhat justifiable but it is hard on relay traffic. This gives an excellent opportunity for the smaller stations to prove their worth. The ones that claim the big boys handle traffic right over their heads during the winter are now in a position to be of great help to relay traffic by filling in the large gaps that are now open in so many of the relay routes. There is a place for a good station in every town on the relay routes which are now largely on paper only.

To handle traffic successfully during the summer season all stations on the route should be within daylight range of each other and none of the jumps over forty miles. Last summer it was found that over certain areas the best time for working was at daybreak when the static was at a minimum. However, in other localities experiments seemed to indicate that at noon or at sunset was also a very good time to clear relay traffic. These experiments were not nearly exhaustive enough and it is one of the things to be accomplished this summer. With this in mind, stations are urged to test with each other at all times of day to determine the best hours of working in certain directions and to let the D.M. know their conclusions.

Northbound traffic if routed so as to reach Sioux Falls, S.D., can be easily handled north over a very good route to all of eastern North Dakota and as far north as Winnipeg, Manitoba, in Canada. The summer northern route is a very successful fizzle when it comes to short jumps. The absence of stations of any description west of Ellendale, N. D., to the 7th district necessitates clearing on only the better nights but all stations plan on listening at least half an hour each night as quite often some very good nights turn up and messages may be cleared by the pound. The route from Wahpeton to Minneapolis would be working nicely if all the stations could work the stations next to them on the route. Stations are especially scarce outside of Duluth and Superior so that no route can come within a hundred miles of these cities. Mr. Bridges, 9YAC, has plenty of confidence in a C.W. set he hopes to have finished soon so perhaps we need have no fear of not getting msgs. to his part of the country.



Station owners in every town are urged to get in touch with their District Superintendents or Division Manager as there are many positions open on the routes that must be filled to make relaying all the year around a success.

Reported messages, 210.

NORTHWESTERN DIVISION

R. T. Galyean, Acting Mgr.

Howard F. Mason, 7BK, newly appointed A.D.M. of Seattle, reports that 7IY and 7BK have been handling nearly all the Seattle traffic the past month. Traffic east goes thru 7FI with little trouble; and traffic south is sent thru 7CW, 7DA, or any number of 6th District stations. Summer conditions practically prevail but no trouble is experienced in working Portland stations, which roar in 'most every night. 6th District stations are heard consistently except those around Los Angeles and the southern part of California. 7MH of Oylmpia has been coming in good of late, and his station may be part of that daylight route to Portland which we are all looking forward to. North of Seattle, 7LS of Ferndale has been on the job regularly and has done his part well. With his help a day-light route from Seattle to Canada is now in operation. 5CP of Vancouver, B. C. seems to be taking traffic and reaching out in fine style.

In Tacoma, Miss Dow, District Supt., reports that, with the coming of summer, fading seems to be more noticeable. Portland stations are beginning to be more in evidence, 7DA being the most reliable

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station handling traffic to the south. The most consistent station to the east is 7FI at Pullman, Washington who is in almost constant communication with stations both east and west of him. 7YA is the most reliable 375 meter station to the east.

H. E. Cutting, 7LY, A.D.M. of Bozeman, Mont., reports things in that end of the Division going as well as usual. There has been little slowing up due to QRN as yet, and signals seem to keep their normal strength. There are two northern routes to the east that can be depended upon at the present; one is thru 7CC to 7LY to 7ZO and the other thru 7YA to 7ZO or 7LY then to 7EX or 7ZG. From these stations to the south traffic is handled thru 6ZH or 6ZR.

At Portland, Old Man QRN has started his program of relentless interference, and the Sixth District stations have begun their summer fading program which retards the speed of traffic flowing in that direction. The northern stations in Tacoma, Seattle and Vancouver, B. C., are coming to life as far as the Portland District is concerned. These stations are seldom heard during the winter months, but with the coming of warm weather their signals seem to get through to Portland with but little QSS. This is one of the freaks of the Northwest.

The eastern stations in Idaho and Montana are coming in with their old reliability, the weather having little or no effect upon their signals. The Eugene, Oregon, stations are getting south at times, but are seldom heard here. 7CN at Marshfield has been heard during the month but has not been worked. Messages in that direction are QSR'd through the 6th District stations who seem to have less trouble in working him. Astoria and the lower Columbia River District seem to be dead at present as no stations are reported working out. The Upper Columbia River district seems to show life at times when 7ZH at Enterprise is on the job, but he seems to be taking a lot of sleep lately.

7ZJ at Vancouver has installed a 375 meter wave with which he steps out equally as successfully as with his old 200 meter wave. He has been heard this month by 9KL and 9YW. You'll hear him yet, Hiram!

In Portland 7ED, 7JW, 7GA, and 7DA on sparks and 7ZI on C.W. have been very successful in clearing traffic through this district. 7ZI has worked as far south as Los Angeles with his C.W. set in which he is using two 5 watt oscillators.

At last we have the long needed station at Corvallis, Oregon, where the Oregon Agricultural College is located. 7YJ, ex 7PV is coming through like a local station on his 375 meter wave. 7CW at Silverton, and 7BH at Salem, Oregon, are still holding their share of the air with the same old reliability and efficiency. Owing to lack of organization in many parts of the Northwestern Division, complete reports have not reached the new management. The whole Division is undergoing a complete reorganization, a report of which will be forthcoming in the near future.

Reported messages, 720. Busiest station, 7BK, 112.

ONTARIO DIVISION

K. Russell, Mgr.

May has been the best ever for the Ontario Division. In spite of extremely heavy static throughout almost the entire month a practical working relay chain through Southern Ontario has been initiated and by far the most messages ever handled in Ontario Division have been relayed this month. This has been in the main due to the fact that several new stations have been put in commission, and have vastly improved the chances for a really reliable working chain in the fall.

W. Carter reports from Windsor that messages are going thro' well tho the QRN has been terrific lately. A new Radio Club has been formed in Windsor and vicinity which will endeavor to handle traffic in co-operation with the A.R.R.L. working under a modification of the Chicago plan.

In the Southern District there has been a change in the D.M., as Wes. Mitchell, 3BA, has had to abandon the position owing to press of business. Gowan of 3DS in Kitchener has taken over his work. This district has shown a startling improvement within the past six weeks, and there are now several good reliable stations which can be counted on for assistance in relaying messages south and west, notably, 3KS in Niagara Falls, Ontario, 3MO in Port Colborne, and 3LI in Welland. All these stations have been in touch with Toronto and other Ontario stations many times, and will furnish invaluable assistance in forwarding traffic from now on.

In the Toronto District there has also been some improvement and the new station erected by E. Rogers of 3BP has been of considerable value for relay work. Mr. Rogers has moved his station complete to New Market, Ontario, about 30 miles north of Toronto. This has enabled him to use a longer wave length, and has got him out of the local QRM so that his range is much more effective now. He has already succeeded in working 3DS in Kitchener, 3BA in Brantford, and 3KS in Niagara Falls. Traffic from this station has also been forwarded thro a number of Buffalo stations. 3BP advises that during the past winter season his signals were copied at sea 1600 miles east of Newport News, and at 9OE in Wichita, Kansas. He reports having handled 24 messages in less than a

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week after getting set installed. In Toronto, 3GE has been maintaining a regular early morning schedule with 8CG in Niagara Falls, N. Y., and at present the most reliable means for getting traffic to Toronto and other Ontario points seems to be through the latter station, or 8FE or 8AHV.

In Eastern Ontario static and vacation time has cut down work to a very large extent, and no report has been forthcoming from that region this month.

Reported messages, 73.

ALASKAN DIVISION
Roy Anderson, Mgr.

Thru the kindness of 7PO of Seattle, two more Alaskan amateurs have been brought to light. Those two are R. E. Pratovich, Bay View, Alaska, and L. C. Grove, of Kenai, Alaska. Letters have been sent these amateurs for particulars as regards their set.

Canadian 3HL advised that there were two amateurs in Prince Rupert and Canadian 4CB advised there were four. An attempt has been made to learn the power of these stations.

According to Mr. Maynard, these amateurs will only be alowed 50 meters wave length because they are on a route of navigation. The same probably holds true of all British Columbia coast stations. Those farther inland, however, are allowed from fifty to two hundred meters. There are about sixty licensed amateur stations in B. C. and with this number it will be, probably, possible to establish a relay route thru B. C., southward into the states, or, preferably, communication can be carried on with Seattle direct and the B. C. stations will have to be called upon only occasionally or else a route can be established eastward thru Canada.

Next month's report will probably contain more timely information as to these B. C. stations, as well as those in Alaska.

WEST GULF DIVISION
Raymond L. White, Mgr.

Mr. Tilley, So. Tex. Dist. advises reports are rather meager on account of having hardly three nights to handle traffic during the month due to heavy QRN, but day-light work has been going on in his district with a rush and a surprising number of messages have been handled.

Austin is down to one station, 5ZU, so it falls to 5ZU to stand watch all hours of the day and regular schedules are maintained daily with 5XB, 5YI, 5YK, 5FA and 5KP and several others. Day-light work within 200 miles is comparatively easy.

The Texas University's station is nearing completion and will have a regular staff of operators who will stand watch each night from 7 to 11 p.m.

Mr. Sahm (5YK) at New Braunfels, Texas is making good.

A.D.S. Daniels, of Houston, reports conditions for reception and transmission for the past thirty days have been spasmodically good then bad, and most of the traffic moved into or out of Houston and vicinity has been done during day-light hours, with but few exceptions.

Earl Lester, 5NK, is our newest first class station and is doing some creditable work.



5ZW is doing some fine short distance work with his C. W. 5ZAA and 5CA are getting some interesting results with 110 A.C. on the plates of audiotrons and VT's.

D.S. Falconi, of the New Mexico District, states that atmospheric disturbances are slowly but surely isolating the southwest, though traffic has been going through. In an effort to make the handling of traffic during the summer possible, a C.W. set has been installed at 5ZA, and schedules are desired with other C.W. stations within easy range so that tests may be made. The power at 5ZA is 20 watts.

D.S. Dill of the Oklahoma District informs us that as far as League matters are concerned things look very well, but the chances of passing traffic through regularly do not look very encouraging. Traffic has been moving slowly at times, but impossible to work at all some evenings. Traffic can be handled with 5ZA on his C.W. set when his spark is unreadable through the static.

Several new stations have been found over the state this month.

Station 5RK of Norman, Oklahoma is now doing some good work, also 5JR at Enid is still working OK. 5CP of Oklahoma City is installing C.W.

H. P. Heafer, Dist. Supt., reports a complete reorganization plan in the Northern Texas Dist. Mr. John S. Dorsa, A.D.S., Dallas Territory, did not make a report. This is regrettable as there is some very good work being done in that Territory and no doubt has been reported by individuals. It is understood Dorsa has converted his aerial into a clothes line and his condenser tank into a wash tub; in short John is in the Laundry business now having purchased an interest in a local laundry. His report must have been lost in the wash. Huh?

In spite of the Laundry QRN, regular QRN and some O.W. QRM, there has been some relay work in the Dallas Territory and in Dallas proper some interesting de-

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monstrations of radio telephony, including radio dances, radio lectures and radio concerts, Mr. Bennett Emerson, 5ZG, furnishing the transmitting set.

Central Territory briefly reports by Mr. Guy Neel, 5XJ, a number of new stations among them being Mr. William Clark, 5ZAF, Waco. This station will prove very valuable as a relay station.

Western Territory, J. M. Martin, A.D.S., reports several new stations going up in vicinity of Amarillo but very little relay being done due to heavy static. A few messages are getting thru.

ATLANTIC DIVISION

Chas. H. Stewart, Mgr.

Report of Trunk Line Tests

On the nights of May 23, 24 and 26, trunk line tests were conducted over the northern and southern routes of the Northern Section of this division. They were none too successful, due to the unfortunate conditions that prevailed. In the first place the short notice given to stations along the lines caught a number of them unprepared and it just happened that quite a few were at the time undergoing repairs and changes. This particularly existed in the case of the most essential stations. Furthermore, many others were temporarily closed on the accout of owners taking examinations at colleges, etc. In addition to this, to make matters worse and preventing large gaps to be covered, the atmospheric conditions throughout both New Jersey and New York were reported very bad on the first two nights. Fortunately weather conditions improved the last night and this was a great help.

All the fellows took keen interest in each test and showed their true spirit by cooperating heartily. Several of the Boiled Owls stayed right with the test until it was impossible to hear the faintest sign of a signal from any station on the route. FB, and thanks for the way in which you all responded. The story of the tests is given for the benefit of those who were not on the job and missed a lot of fun. A complete copy of all logs has not been turned in, therefore some credit may be missing where it is due.

New York to Philadelphia Test.

It was originally planned to route this message via the northern route through 3XM, Princeton, N. J., but at the last minute advice was received that because of examinations held on the above dates they would be unable to work. This station, being the only one which can consistently work Philadelphia and New York, in not operating made a change necessary and therefore the southern route was selected. This had to be abandoned immediately as it developed some of the reliable stations were temporarily out of commission. Furthermore, the local conditions prevented communication from Long Island points to Atlantic City, N. J. Knowing that transmission on the 23rd was impossible, 2JU handed a message to 2ZL addressed to 3ZS for broadcasting notifying him of test being called off. This message was received by 3NB at 10:30 p.m. (few words missed but were copied by 3AAN who furnished same), QRN bad, poor signals and extreme QSS on all N Y. City stations. Relayed this message to 3HJ, QSO good. 3HJ immediately relayed to 3ZS. Signals from 3ZS not audible at 3NB. At 10:58 3HJ handed reply to 3NB but it dropped dead there as the latter could not connect up with any 2nd district station. It was sent to 2GR the following evening and relayed from there to 2JU. May 24th: Signals of 3NB were coming in very good at 2JU and in view of this it was planned to try to work him direct which was done. Another message addressed to 3ZS was sent without breaks to 3NB at 11:08 p.m., who immediately relayed it to 3EH. 3EH started to give message to 3ZS but blew condenser and had to deliver message over the land telephone. May 26th: Message from 2JU to 3NB at 10:10 p.m. 3NB called 3HJ and started message at 10:16 but 3ZS who was standing by copied this message direct from 3NB. Reply sent from 3ZS to 3HJ at 10:20 who in turn sent it to 3NB at 10:24. 2JU standing by, copied message direct from 3HJ and gave final OK to 3NB at 10:25. Actual time consumed both ways 15 minutes. There was no slip in the handling of this message and credit is due all concerned. The time, which probably is no record must be considered very good.

New York to Albany.

May 26: This message together with one for Buffalo was sent by 2JU to 2GR at 10:38 p.m. 2GR had difficulty in raising stations between that point and Albany. Stations 2BB, 2DA, 2AR and 2BM could not be heard and delay existed on account of none of these stations answering 2GR. 2UA was on job and could have cleared 2GR but it would have done no material good as he would have had trouble working north. 2SZ, 2AWF and 2FG all copied message while being sent 2JU to 2GR but only 2SZ was able to get it complete, due to the others experiencing QSS and bad QRM. At 11 p.m. 2JU and 2SZ got in communication with each other and the latter OK'd for the msg. However, immediately upon copying message from 2JU to 2GR he relayed it to 2FG, which was at 10:42. For some unknown reason 2FG did not secure reply but the fact remains it reached Albany in 4 minutes.

New York to Buffalo.

On the nights of the 23rd and 24th very bad luck was experienced, due to the bad

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conditions. The first night message was given by 2JU to 2DI who in turn relayed it to 2UA. 2UA could not clear it further as he could not get in communication with anyone north of him. 2BB was on the job and copied message direct from 2JU but he also being unable to work any one north, message as far as the reports so far indicate dropped dead there. About the same conditions existed the following night but 2GR had been added and message was started through him with 2DI standing by. It is possible that one or more of the upstate stations had copied direct from 2JU but logs received up to the present writing do not show this. The final night was a little more successful. This time, although the message never reached Buffalo, it did get to Utica. 2JU started to 2GR who could do nothing on account of no stations working north to Albany. 2SZ had copied the message direct from 2JU as did 8HP. 2SZ not knowing that 8HP had copied it, called him several times but conditions between these points were bad and he could not connect. In the meantime 8HP was calling his head off, trying to raise stations west to Buffalo. He got hold of 8MDG, sent message twice but had to give it up as the latter station could not get it. Then he got in communication with 8FE, but on account of bad conditions he could not get it. The last attempt was made with 8AGK, when he sent message four times but it was utterly impossible to push it through and it had to drop there. 8HP certainly deserves thanks for his courage and patience in trying to get that message through. If we had better weather conditions, without question the Buffalo message would have been delivered and reply received and it is to be regretted that the outcome was so unfortunate.

Reports

It is noticed that the coming of summer with its QRN has caused a slackening of interest in relay affairs with a marked decrease in messages handled.

Mr. Lester Spangenberg, 2ZM, one of the few remaining old-timers in this Division, has been forced to resign as D.S. for northern New Jersey and may possibly have to withdraw from the game. This is sadly regretted, as 2ZM is a true amateur, a wonderful asset to our organization, and very well liked by all fellow amateurs. Mr. Ted Ostman, 2OM of Ridgewood, N. J., has been appointed as the new D.S. Ted has all the best wishes of his many friends and will prove his worth as a capable representative.

That stations in New Jersey may easily know who their D.S. is, the territory previously allotted the two Supts. has been changed in a few places, so that all stations whose call letters began with the number 3 will come under the jurisdiction of Mr. Marcus Frye, 3NB, Vineland, and those whose calls begin with the number 2 will come under Mr. Ostman, 2OM, Ridgewood.

We have lost one of our most efficient stations in the suspension of license of J. K. Hewitt, 2RK of Brooklyn. This suspension has caused considerable comment and agitation in this vicinity and it is to be regretted that such a thing should fall upon one of our best stations.

The Second District Council is forming regulations and traffic rules. Without question it will be something long wanted and we will not have to look forward to next season with the conditions of last season in mind. An invitation is extended all radio clubs in the Second District to join the council at once in order to be represented.

Benzee Bros., D.S. for Western N. Y., report only 391 msgs. handled, somewhat of a decrease. Numerous spark stations are being converted to C.W., and with the new C.W. stations traffic will be kept moving thru the summer. City Manager Haire (8GI) of Rochester has been forced to resign account entering the commercial game. 8FE is now using C.W. and has done very good work with four VT-2's. J. J. Young, 8HJ of Elmira, has been appointed City Manager of that city, and reports traffic moving very nicely there.

Carl E. Trube, D.S., Hudson Valley, reports that section of the N.Y.C.-Buffalo route from Yonkers to Hudson in splendid working order. 2DN, 2BK, 2BB, 2DA, 2AR and 2BM are handling traffic consistently. 2OA, 2HJ, 2UA and 2DK make a fine outlet for New England traffic, and all are handling heavy business. Complete record of traffic is not available, but 2BK handled 209, giving an idea of the volume. Plans are under way for a branch route towards Binghamton and all stations wishing to be appointed official relayers thereon should communicate with Mr. Trube.

F. H. Myers, D.S., Capitol Dist., reports a great deal of interest in the formation of his newly-created district, with everyone working hard on the New York to Buffalo route. 2SZ is back after repairs; 2FG temporarily closed. E. M. Williams of 2SZ has been appointed C.M. for Troy and the following official relay stations appointed: E. Wirsing, 2AWF, Albany; Geo. Benas, 8HP, Utica.

Dr. E. A. Cyriax, D.S. for New York City, reports that altho his district contains more stations than any other in the country, it has few DX stations and practically all outbound traffic must be relayed to a suburban DX station. Until local QRM is reduced local DX men will not be able to do their share. It is hoped that the Council regulations will overcome this handicap. 2CI and 2IF have been appointed official relay stations. Will others wishing appoint-

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ments please communicate with Dr. Cyriax? 2DI handled 51 msgs.; 2CT closed down but expects to be on again shortly.

F. A. Maher, D.S., Brooklyn, advises that in the enforced absence of 2RK the traffic ordinarily handled by him is being absorbed very nicely by the other DX stations. 2WB is back after a long absence and proves a big help. The following are also doing their share: 2BO, 2ARY, 2MM, 2MB, 2PF, 2OW, 2DO, and 2RM.

Ted Ostman has just been appointed D.S. of Northern N. J. and so has not had sufficient time to become acquainted with his position. Traffic reports show a slight decrease as expected. 2AXB handled 25 messages during three weeks in May; 2AFP 68 for the month; 2BOC 80, and 2OM 248. 2VA not very active account college exams. 2UE is changing from spark to C.W. 2AJF is doing splendid work wtih his C.W. and we would like to see him handle more traffic.

Marcus Frye, Jr., D.S., Southern N. J., reports the same slowing up in movement of traffic as other sections. For the first time in history this district has been in direct communication with Baltimore, and considerable traffic has now been handled. Altho the distance is short it has always been very difficult to work this city, due to peculiar local conditions. 3FB is under repairs. A series of tests between 3NB and 3XF has been carried on in effort to establish daytime communication but results have not been very satisfactory to date. 3BA reports 14 msgs., 3AAN 20, 3EH 20 and 3NB 54.

H. S. Collins, D.S., Long Island, reports a much-needed efficient station in that of 2BML, Riverhead, L. I. Without question this station will be of great assistance in clearing traffic between N.Y.C. vicinity and New England. 2BGR and 2AJW are doing very good work with their C.W. sets and clearing lots of traffic. 2JU handled 123 msgs. during the last month. 2ZL and 2EL are doing excellent work and have cleared more traffic than many others, altho the exact number is unknown. (2ZL-2EL: Hw abt a report?—T.M.)

B. P. Williams, D.S., Western Penna., reports traffic fallen off due to summer weather and static. On Branch Line 2 between Monaca and Uniontown not much traffic is being handled, altho large volumes are moving from Monaca to Erie. Regular summer work is being pursued by 8WY, 8HA, 8HY, 8JQ and 8RU. 8ZD, 8DV, 8VQ, 8PN and 8MT will be off duty, overhauling and rebuilding. Our newest station, 8RU, will take the place of 8ZD in Pittsburgh for the summer. Western Penna. is decidedly hilly and stations located on high ground find QRN much more terrific than in other parts of the country, handicapping them by comparison with other localities where operators are sticking at it regardless of the warm weather. There are a number of good stations north of New Castle in this district whose applications for places on Line 2 Mr. Williams would like to have.

In Central Penna., D.S. H. M. Walleze reports QRN fast shortening the working range but traffic passing fairly well. The trunk line east from Milton is taking shape. A new station at Shamokin, 3AJZ, has opened up and should be able to work Reading, who has a schedule with Allentown, from where traffic passes easily to New York and some to Philadelphia. As yet no one has been located to substitute for 8XE this summer.

Slackening in traffic work is noticed in Eastern Penna. District, in the report of Supt. S. W. Place. Mr. Ehrhardt reports things dull in his territory, with few new stations. 3WX's new station is almost finished and will be regularly QSO Reading and York. Mr. Place's station has been granted a license to operate on 375 m., call 3ZV, and a C.W. set is now under construction, which will help in moving traffic.

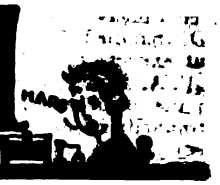
Geo. L. Deichmann, 3HG, the recently appointed D.S. for Eastern Maryland, reports he has been unable to collect much data for his report this month. 3HG has been forced to abandon his morning schedule with 3ALN, Washington, because of examinations, but Baltimore C.W. stations, including 3ER, 3OU, 3AC, 3GZ and 3CT have arranged to keep up the connection. 3OU and 3AC have blossomed forth as regular DX stations and 3EQ, 3CT, 3EM, 3AJD and WJ have come to the rescue of summer traffic with C.W. stations that show some promise of putting the sparks on the shelf as long as static continues so annoying. 3EM has likewise abandoned the spark for C.W. Baltimore, Washington and Hagerstown at a joint club meeting have arranged for a regular daylight schedule connecting them. Conditions between Baltimore and Phila. are suffering badly for lack of perfect connection during the summer towards Phila. and Wilmington. It is suggested that the Phila. C.W. stations that are doing exceptional work should make tests with those in Baltimore with a view of perfecting a reliable schedule.

In the Dist. of Columbia, Francis Baer, D. S., the C.W. stations of 3AAO and 3ABI have blossomed forth as real DX workers. 3AAO is using two U tubes as oscillators with an antenna current of 3.5 amps., and has for nearly two weeks kept a reliable nightly schedule with 4GL in Savannah at 10:30, with 2BML at 9, and lately with 3ER in Baltimore at 9:30 on Mondays, Wednesdays and Fridays, all using straight C.W. 3ABI has a schedule with 1TS at 9:30 p.m. 3XF has made several unsuccess-

(Concluded on page 62)

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Calls Heard



HEARD DURING MAY.
Unless Otherwise Specified.

Instructions to reporters:

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

Heard at Sea by ex-9ZT from March 22 to April 7. At dock in New Orleans: 4CG, 4XC, 4YA, 5AF spk. & C.W., 5DA, 5EW, 5HO, 5IB, 5IF, 5JA, 5MY, 5NG, 5XA, 5XB, 5YH, 5ZA, 5ZR, 5ZX, 8AS, 8DZ, 8ML, 8ZL, 9CA, 9EL, 9GO, 9HI, 9KR, 9LQ, 9NQ, 9OE, 9OX, 9PS, 9UF, 9UT, 9XM, 9YA, 9ZB spk. & C.W., 9AAC, 9AAG, 9AFX, 9AIZ, 9ANV, 9AON, 9ARJ, 9ASN C.W., 9DSX, 9DGP, 9DIW. 200 miles southeast of South Pass (La.): 2RK, 4XC, 4YA, 5CA, 5EC, 5EG, 5IB, 5JD, 5LA, 5NC, 5XA, 5XB, 5YH, 5ZA, 5ZAA, 8DC, 9FK, 8SP, 8ARS, 9CA, 9EL, 8GJ, 9NQ, 9QO, 9WE, 9ZB C.W., 9AAC, 9AHO, 9AON, 9ARJ, XF-1 C.W.
350 miles southeast of South Pass: 1XM C.W., 1JAP, 3RK, 2ZL C.W., 4BP, 4DL, 4FD, 4AU, 5ZE, 5ZAB, 8DC, 9XK C.W., 8ZC, 9EL, 9MC, 9AOH, NBY C.W.
300 miles southeast of Key West: 4DL, 4FD, 5ZAB.
700 miles southeast of Key West, off Puerta Plata, Haiti: 1XM C.W., 4DL.

Heard Aboard KOGS, S. J. Mallery, Opr.
Jan. 21 (60 miles south New York): 1IRJ, 2AGS, 2AOG, 2AUJ, 2BGR, 2EL, 2IT, 2TK, 3EN, 3FG.
Jan. 22, (200 miles south New York): 1XT, 2DA, 2DN, 2EL, 2HN, 2OA, 2PD, 2ZM, 3ACM, 3BG, 3BH, 3BZ, 3EH, 3EJ, 3HG, 3HJ, 3ND, 3PU, 3UC, 3YV, 4BY, 8JS, 8XE, 8ZD, 8ZL, 9JN 9ZN, 9ZQ, XF1 C.W.
Jan. 23, (450 miles south New York): 1HAA, 2OA, 2RK, 3ND, 4BK, 4BY, 4FD, 8RP, 8XE, 8ZD, 9AWX, 9OX.
Jan. 24, (700 miles south New York): 1IRJ, 2EL, 2NY, 2OA, 2RK, 2ZC, 3CC, 3DH, 3HJ, 3HX, 3KM, 3NB, 3VV, 4AG, 4BK, 4BY, 4CD, 5EA, 5YE, 8ACF, 8ARS, 8BO, 8HA, 8IK, 8ML, 8OI, 8SP, 8ZL, 8ZR, 9AEG, 9BY, 9EQ, 9FS, 9OX, 9UU, 9VZ, 9WE, 9YC, 9ZB, 9ZL, NSF C.W.
Jan. 25, (off Miami): 2EL, 2OE, 2RK, 3EN, 3HJ, 3NB, 3NC, 4AT (daylite), 4BK, 4BY, 4CK, 5ER, 5JE, 5ZX, 8ANB, 8ZD, 8ZL, 9OX, 9ZB.
Jan. 26, off Key West (QRN bad): 5LH, 5JE.
Jan. 27, (200 miles west Key West QRN bad), 5LR.
Jan. 28, (400 miles east Tampico): 5BR, 5HL, 5IS, 5KP, 5LR, 5XA, 5YH, 5ZK, 9AAC, 9AAG, 9AEG, 9AEY, 9AXJ, 9LR, 9MC, 9OE, 9YM, 9ZB.
Jan. 29, (100 miles east Tampico): 5BC, 5LR, 5ZF, 9AAC, 9AEG, 9LR.
In port Tampico (Feb. 6th to Feb. 14th): 5DA, 5EJ, 5HL, 5HZ, 5JD, 5JE, 5LR, 5YH, 5ZC, 5ZG, 5ZT, 5ZU, 5ZW, 5ZX, 9LR, 9OE.
Feb. 15, (100 miles northeast Tampico): 4XC, 5EW, 5FA, 5HL, 5HZ, 5IF, 5IS, 5JE, 5JX, 5KP, 5LM, 5LR, 5MF, 5XA, 5XB, 5YH, 5YM, 5ZA, 5ZF, 5ZG, 5ZK, 5ZP, 5ZR, 5ZU, 5ZX, 6IG, 9AEG, 9EL, 9FU, 9HI, 9HN, 9LR, 9MC, 9OE, 9SZ, 9WE, 9ZZ.
Feb. 16 (250 miles southwest South Pass): 2RK, 4XC, 5HL, 5HN, 5HV, 5HW, 5IS, 5JE, 5MF, 5YH, 5ZA, 5ZX 8ADE 8ZY. 9AAF, 9EL, 9EQ, 9HI, 9HN, 9LR, 9NQ, 9OE, 9TV, 9ZL.
Feb.. 17 (off Burrwood, La.): 1IRJ, 4AG, 4FE, 4XC, 5DA, 5EJ, 5JD, 5JE, 5LR, 5MF, 5XA, 5YH, 5ZA, 5ZP, 8HG, 8IK, 8XK C.W., 8ZA, 8ZY, 9AIX, 9EL, 9EQ, 9ET, 9HI, 9LR, 9MC, 9WE, 9XM, 9ZB, 9ZJ, 9ZQ.
In port Gulfport, Miss. (Feb. 18 to 22nd): 2RK, 3GO, 4AG, 4AU, 4BK, 4BY, 4CG, 4FD, 4XC, 5BM, 5CL, 5DG daylite), 5DI, 5DQ, 5EA, 5EK, 5ER, 5HL, 5HV, 5HW, 5IE, 5IS, 5JD, 5JE, 5JX, 5KP, 5LA, 5LR, 5MA, 5MF, 5OD, 5XA, 5XB, 5YE, 5YH, 5ZA, 5ZC, 5ZD, 5ZE, 5ZG, 5ZK, 5ZP, 5ZS, 5ZU, 5ZX, 8AKV, 8DC, 8KP, 8XE, 8XS, 8ZE, 8ZL fone and spk., 8ZY, 9ABD, 9AEG, 9AON, 9ASL, 9BW, 9BY, 9CS, 9EL, 9EQ, 9FU, 9HI, 9HN, 9JN, 9LA, 9LC, 9LR, 9MC, 9OE, 9QO 9UF, 9UK, 9UU, 9WT, 9XM, 9ZB, 9ZL, VMI.
Feb. 24, (80 miles south New Orleans): 2EL, 2RK, 3AHK, 3GO, 4BK, 4BY, 4CG, 4EK, 4XC, 5DQ, 5ER, 5HL, 5HS, 5HW, 5JE, 5LR, 5XA, 5XB, 5YE, 5YH, 5ZA, 5ZC, 5ZK, 5ZP, 5ZR, 5ZU, 8AFS, 8AGK, 8CH, 8HG, 8ID, 8XE, 8ZA, 8ZE, 8ZL, 8ZR, 8ZY, 9AKH, 9DC, 9DU, 9EL, 9EQ, 9FS, 9HN, 9LA, 9LQ, 9LR, 9MC, 9OE, 9UK, 9VZ, 9XM, 9ZN, 9ZQ, 9ZZ.
March 9, (50 miles south New Orleans): 4XC, 5DQ, 5HB, 5HN, 5HP, 5HV, 5HW, 5IB, 5JD, 5JE, 5LA, 5XA, 5YH, 5ZP, 5ZX, 8ZY, 9BW, 9EL, 9HN, 9LR.
March 10, (150 miles southwest South Pass): 2RK, 3GO, 4XC, 5IF, 5XA, 5ZF, 5ZP, 7KX, 8KP, 8VJ, 8ZL, 8ZR, 8ZY, 9ANV, 9BW, 9DIW, 9EL, 9ET, 9FG, 9FU, 9GN, 9GT, 9HI, 9JN, 9LF, 9LQ, 9LR, 9OX, 9VN, 9WE, 9XM, 9ZV.
March 12 to 21 (at Tampico) on two bulbs: 1IRJ, 2RK, 4XC, 5AO, 5DT, 5EW, 5FD, 5FL, 5HL, 5IB, 5IF, 5JA, 5JE, 5JI, 5LA, 5LR, 5MF, 5MX, 5MY, 5YH, 5ZA, 5ZAA, 5ZC, 5ZF, 5ZR, 5ZS, 5ZT, 5ZU, 6ER, 6IG 6ON, 6ZR, 9AAC, 9AAW, 9AEG, 9DC, 9DIW, 9EL, 9FU, 9HI, 9HN, 9KO, 9LR 9MA, 9MC, 9OE, 9OI, 9QO, 9YA, 9ZJ, 9ZY, 5GT fone.
April 11 to 20 (in Tampico, but on crystal): 5HL, 5XI, 5ZAA, 5XI, 8ZY, 9AEG, 9MC.

1MO, HARTFORD, CONN.—All C.W.
1BV, 1CBJ, (1FQ), (1NAQ), 1QN, 1TBE, (1TS), 1QAJ, (1UN), 1YM, 2ADL, 2AJF, (2AJW), 2BFZ, 2BML, 2CT, 2DA, 2BB, 2DN, 2HI, 2UD, 2ZL, 2XAC, 2XK, 2XX 8AJ 8AAE, 8AAO, 8BG, 4GL, 8DE, 8IV, 8NQ, 8RQ, NSF, NMW, XB1, XF1.

1FBH, STAMFORD, CONN.—All C.W.
1CK, 1FZ, 1BQH, 2DR, 2RB, 2UD, 2QR, 2XX, 2ZL, 2ZM, 2AJF, 2AKO, 2AWL, 2BDU, 2BML, 8RM, 8XK, 8ZW, NSF, XK1, XK4, KVKA.

1VAW, BRIDGEPORT, CONN.
1AW, 1CK, 1CM, 1CZ, 1CAS, 1CBJ C.W., 1DR, 1DY, 1DAL, 1FY 1FBG I.C.W., 1GM, 1JT, 1LBR, 1MK, 1NBA I.C.W. & fone, 1QN C.W., 1RV, 1SBZ, 1TS I.C.W, 1ZE, 2AEF, 2AFZ, 2AFT, 2AID, 2AJR, 2AJW C.W., 2ANJ, 2ARY, 2ASB, 2ASL, 2AWL fone & I.C.W., 2AXB, 2AYS, 2BK, 2BDU fone & I.C.W., 2BFF, 2BGR, 2BML C.W., 2BNF,

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2BNU, 2BQH fone, 2BRC I.C.W., 2CY, 2DI, 2DK, 2EL, 2FS I.C.W. & fone, 2GR, 2HJ, 2HBF, 2IF, 2IQ, 2JU, 2MJ, 2OM, 2OW, 2RB fone, 2RM, 2TK, 2UA, 2UK, 2VA, 2YM, 2ZC, 3AS, 3ACS, 3CC, 3DG, 3FB, 3HJ, 3HX, 3IW, 3OU, 3PU, 3WX, 3XM, 3ZO, 8AGK.

1IAA, SHARON, MASS. April—May.

2AF, 2AL, 2AWF, 2AX, 2AZ C.W., 2BG, 2BH, 2BM C.W., 2BML, 2BRI, 2BQ, 2BQW fone. 2BZ, 2CC, 2DI, 2DR, 2DZ, 2EL, 2FD C.W., 2GR, 2IL, 2OA, 2OM, 2QC, 2RE, 2RK, 2RW, 2SZ, 2UA, 2VV, 2WR, 2WU, 2XF C.W. &fone, 2XH C.W., 2XJ fone, 2XQ, 2XY, 3BZ, 3CC, 3EN, 3HJ, 3ND, 3OA, 3OU, 3PU, 3XM, 8AC, 8AD, 8AGK, 8AL, 8AMZ, 8AMM, 8ANO, 8ANT, 8AWX, 8BC, 8DA, 8DC 8DD, 8DR, 8DV, 8FE, 8HV, 8HR, 8IP, 8JW C.W., 8JQ, 8MZ, 8QH, 8RU, 8RW, 8VQ, 8VW, 8XA, 8XE, 8YA, 8ZY, 9AAC, 9HR, 9HT, 9JN, 9KB, 9KF, 9ME, 9UH, 9XM, 9YB, 9ZN, 9ZL.

2DK, SCARSDALE, N. Y.

1BBL, 1BM, (1CBJ, C.W. & fone), 1CK, 1FBF, 1GBC, 1GM, 1HAA, 1HO, 1JAP, 1NBA fone, 1WR, 1ZE, (2AJW C.W.), 2AR, (2BGR), 2DA, (2EL), 2FG, 2OE, 3ACS, 3AHK, 3AVG, 3BG, 3CC, 3DV, 333FR, 3GO, 3GU, 3HX, 3OU, 3PU, 8AOT, 8APB, 8DY, XF1 C.W.

2BKJ, GRANTWOOD, N. J.—June 1-6.

1ZE, 1DAL, 1GBC, 1CCY, 2SZ, 3BO, 3CC, 3CK, 3EH, 3EZ, 3GX, 3HG, 3HJ, 3IW, 3IZ, 3JR, 3NB, 3OU, 3PU, 3VW, 3XM, 3ZO, 8ALT, 8BO, 8DY, 8HR, 8PL, 8RQ, 8TK, 8TT, 8WY, 8XK, 8XU, 8ZA, 8AGK, 8AKA, 8ANT, 8AYN.

3ABP, YORK, PA.,—April 20-May 21.

1AW, 1DH C. W., 1DT C. W., 1GBT C.W., 1NBA C.W., 1RD, 1TS, spk. & C.W., 1XB C.W., 1XG, 1XV, 1XX, 2AJF C.W., 2EL, 2HJ, 2MBL C.W., 2RK, 2XF, 2XQ spk. & fone, 2XX, 2ZL, 2ZM spk. & C.W. vy qsa. 3AAE, 3AAB, (33ADB), 3ACS, (3ACY), (3AGT), 3AIC, (3BAH), 3BAK, 3CC C.W., (3DB), 3EN, 3EQ, 3GO, 3KZ, 3LP, 3NB, 3NC, 3NY, 3PB, 3PU, 3SJ, (3WX), 3XF, 3XM, 3YE, 3YK, 3YV, 3ZA, (3ZO) spk. C.W. & fone, 3ZS, 4CX, 4GX, 4ME C.W., 4XB fone, 4XC, 5PA, 5XA, 5XB, 8AGK, 8HJ, 8HP, 8KM C.W. & fone, 8KZ, 8LA, 8OF, 8PT, 8RQ C.W., 8UK C.W., 8XK C.W. & fone, 8XU C.W., 8ZL, 8ZR, 8ZW, 8ZG C.W., 9AAC, 9AJI, 9AL, 9BY C.W. & fone, 9DBT, 9HR C.W., 9JG, 9RN, 9XI C.W., 9ZG, 9ZJ, 9ZL, 9ZN, KDKA fone, NSF C.W. & fone, WWX, NMW C.W., KQG fone, WWV C.W., XFT, Canadian 3BP, 3EI.

3AOV, STONEGA, VA.

(4AG), 4AL, 4BT, 4CK, (4DA), 5EK, 8AAS, 8AKS, 8AK, 8BM, 8BO, 8DI, 8EC, 8ID, 8LW, 8OJ 9AAZ, 9AAC, 9ANV, 9AJT, 9APS, 9AZT, 9LQ, 9SH, 9UC, (9UH), 9UZ.

3ALR, WASHINGTON, D. C.

1AW, 1MAD, 2EL, 2JU, 2KL C.W., 2OM, 2RK, 2RM, 3BP, 3CC C.W. & spk., 3EH, 3EQ C.W., 3HG, 3HJ, 3IC, 3NB, 3PU, 3XM, 4GL, 4YA, 5ZA, 8AM, 8AIO, 8HR, 8JM, 8PU, 8RQ C.W. & spk., 8XK C.W., 8XM, 8ZA, 8ZR, 9UH, 9UU, 9ZN, XF1.

3EZ, PORTSMOUTH, VA.—May 8-June 8.

1AW, 1BA, 1CZ, 1GM, 1JAP, 1ZE, (2ACD), (2AFJ), 2AHK, (2ARD), (2ARY), (2EL), 2ERN, 2GM, 2KL C.W., (2JU), 2OM, 2TS, 2UK, (2WB), 2XK C.W., 2XM, 3AD, 3AL, 3BG, 3BP, 3BZ C.W., 3CC, (3EH), 3EL, 3EQ, (3FBS), 3FJ, 3HB, 3HG, (3HJ), (3HX), (3IW), 3IX, 3JX, (3KM), (3LP), (3NB), 3NX, (3OU), (3PU), (3QN), 3RQ, 3RX, 3UK, (3WX), (3XF), 3YK, (3YH), 3ZA, 3ZO, (4BY), (4GN), 8AEE, 8AFA, 8AGK, 8AGO, 2AJT, 8AMQ, 8ANW 8BO, 8BK, 8CI C.W., 8DE C.W., 8DP, 8HJ C.W., 8HR, 8LX C.W., 8OI, (8RQ), 8TK, 8TT, (8TY), 8WA, 8WR C.W., 8WY, 8XA, 8XM C.W., 8XK fone, 8YN, 8ZG C.W., 9AAW, 9AGV, 9ANC, 9ANV, 9FS, 9ME, 9PC, 9UH.

5ZU, AUSTIN, TEXAS.

(4XC), 4GL C.W.., 4YA, 5AG, 5EA, 5EF, (5EK), 5BR, (5CC), (5FA), (5FB), (5HE), 5HF, (5HL), 5HH, 5HB, 5IP, 5IF, 5IB, (5JE), 5JD, (5JS), 5KB, 5KV, 5LR, 5LM, 5LP, 5MF, (5MG), 5MX, (5NK), (5OR), 5RH, 5WI, (5XB), (5XI), (5YE), (5YH), 5YI, 5YM, (5YK), (5ZA spk. & C.W.), 5ZD, (5ZP), (5ZR), (5ZX), (5XAB), (5ZC), 5ZS, (5ZF), (5ZW), (5ZE), (5ZL), (5ZAA), (5ZAE), (5ZAF), (6ZZ), 6ZL, 8YN, 8ZZ, 8ZY, 9AEQ, 9AEG, 9AAC, 9AEY, 9AIZ, (9ALG), 9ARP, 9ANV, 9ANP, 9AR, 9ACJ, 9AUS, 9ANF, 9BW, 9DW, 9DL, (9EL), 9EQ, 9EK, (9HI), 9IY, (9JN), 9JA, 9JM, 9JC, 9KW, 9KV, (9LR), 9LA, 9LI, 9LQ, 9LC C.W., 9MC, (9OE), 9ON, 9PS, 9QO, 9SZ, 9TI, 9UH, (9WI), 9WW, 9XY, 9XAE, 9XM, 9XI, 9YM spk. & C.W., 9YI, 9YA, 9ZJ, 9ZL, 9ZN, 9ZQ, 9ZA, 9ZB, (9ZH), 9ZR, 9ZV, 9ZAB.

5FO, NORMAN, OKLA.

9OE, 5NK, 5LC, 5JI, 5ZK, 5OH, 5ZS, 5HQ, 5XI, 9DE, 5NW, 5QA, 5HX, 5ZA, 5DW, 5LK, 5JR, 5HZ, 9AE, 5AR.

5YK, NEW BRAUNFELS, TEXAS.

4XB C.W., 5XD, (5XB spk. & C.W.), (5XI), 5YE, 5YH, (5YI), 5YL, (5ZA spk. C.W. & fone), 5ZC, 5ZD, 5ZE spk. & C.W., 5ZF, 5ZX, 5ZL, 5ZN, 5ZP, (5ZR), (5ZU), 5ZV, 5ZW, 5ZX, 5ZZ spk. & C.W., 5ZAA C.W., 5ZAB, (5ZAE), (5ZAF), (5ZAG), 6ZZ, 9BY C.W. & fone, 9YI, 9ZC, 9ZU, 9ZJ, ZQO, ZA1, (ZD1), (ZK1), (ZM1), BW4 C.W., (AG5), AA6 C.W. Specials only, including army stations; others too numerous.

5KP, ELGIN, TEXAS.

2ZL, 4AG, 4YA, 5AG, 5BV, 5BM, 5CC, 5CL, 5DA, 5DB, 5DW, 5EF, 5EJ, 5EW, 5FL, 5HF, 5HV, 5IF, 5IS, 5JA, 5JS, 5KA, 5LK, 5LM, 5LR, 5MG, 5XA, 5XB, spk. and C.W., 5YE, 5YI, 5ZF, 5ZK, 5ZL, 5ZS, 5ZU, 5ZW, 5ZZ, 5ZAE, 5ZAF, 6GF, 7KX, 7YA, 8KP, 8YG C.W., 8ZG C.W., 9BW C.W., 9EI, 9FF, 9FK, 9FU, 9HN, 9HM, 9HN, 9HT, 9OR, 9OE, 9QU, 9WI, 9XM C.W., 9ZAC, 9ZN.

6ZT, SALT LAKE CITY.

5IF, 5ZA, 5ZZ, 6AE, 6AH, 6AK, 6AN, 6AW, 6BJ, 6BQ, 6BR, 6CO, 6CV, 6DH, 6DK, 6DP, 6EA, 6EB, 6EJ, 6EN, 6ER, 6FE, 6FH, 6FI, 6GY, 6HY, 6IC, 6IF, 6IG, 6JN, 6JR, 6JT, 6KA, 6KL, 6KM, 6KR, 6LC, 6MK, 6OH, 6PJ, 6PR, 6PY, 6QJ, 6QR, 6QY, 6RE, 6UM, 6VS, 6WV, 6XZ, 6ZE, 6ZH, 6ZK, 6ZN, 6ZO, 6ZR, 6ZS, 6ZU, 6ZY, 6ZY, 6ZZ, 6AAH, 6AAT, 6AAK, 6AAW, 6ACA, 6ACR, 6AFX, 6AFY, 6BAB, 6BAC, 6XAD, 7BH, 7BP, 7BR, 7BV, 7CC, 7CW, 7CU, 7DA, 7DS, 7EX, 7FL, 7GQ, 7IM, 7IN, 7JX, 7YA, 7YS, 7XB, 7ZB, 7ZD, 7ZG, 7ZJ, 7ZO, 7ZK, 8XK, 9EL, 9HT, 9LR, 9LW, 9OE, 9PS, 9YW, 9AFX, 9AMB, 8AVU.

6AUB, SAN DIEGO, CAL.

5ZA C.W. & spk., 6AE, 6AK, 6AQ, 6DP, 6ED, 6EN, 6ER, 6GE, 6HI, 6IF, 6IL, 6JM 6KA 6KM, 6LC, 6MK, 6OC, 6OH, 6OW, 6RN, 6SK 6UM 6ZA, 6ZH, 6ZK, 6ZN, 6ZR, 6ZU, 6ZX, 6ZZ, 6AAK 6ABP, 6ACY, 6ADX, 6AIL, 6XAD C.W.

THACHER SCHOOL, OJAI, CAL.

6AAG, 6AAK, 6ACY, 6ADA, 6ADL, 6AGC, 6AGF, 6AGL, 6AHQ 6AJE, 6AK 6ALE, 6APH 6AQU, 6ARG, 6BF, 6BG, 6DP, 6DS, 6EB, 6EC, 6EN 6ER, 6EX, 6FH, 6FI, 6GP, 6IM 6IY C.W., 6JN, 6KI, 6KM, 6KW, 6LW, 6NG, 6NY, 6OL, 6PO, 6PR, 6TF, 6ZK, 6ZN, 6ZU, 6ZX, 7CC.

7DA, PORTLAND, ORE.—April 15 to May 15.

(Canadian 5BA), (Canadian 5CJ), (6AH), 6AK, (6CH), (6CP), 6DD, (6DP), 6ED, 6EN, 6EP, (6EX), (6FH), 6GF, (6HC), (6HP), (6IC), (6KA), (6KL), (6LC), (6OC), (6OH), (6OW), 6PR, (6QR), 6SK, (6SR), 6TA, (6TC), 6TV, 6VM, (6WZ), (6ZR), (6ZU), 6ZX, 6AAP, 6AAU, (6AAW), 6ABM, (6ABX), 6ACA, 6ACI, 6ACM, (6ACR), 6AFN, 6AFY, (6AGF), 6AIT, (6AIW), (6ANK), (6APH), (6ZAA), (7AD), (7BA), (7BC), (7BH), (7BK), (7BQ), (7BV), 7CA, (7CE), 7CN, (7CW), 7EO, (7FI), (7FQ), (7ID), (7IY), (7KM),

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7KQ, (7D), (7NL), (7NN), (7OF), 7PV, 7YS, (7YA), (7ZG), 7ZH, (7ZM).

7ZG, BEAR CREEK, MONT.—During April.
2RK, 2ZL, 3HK, 5IF, 5ZA, 6AEZ, 6JT, 6KA, 6LC, 6NQ, 6OT, 6VS, (6WV), 6ZA, 6ZB, 6ZH, 6ZU, 6ZZ, 7AD, 7BQ, 7CU, (7DA), (7DH), (7EX), (7FI), 7FL, 7FQ, 7GK, (7IM), (7JW), 7LN, (7LU), (7LY), 7MB, 7MC, 7MP, 7NN, 7NL, 1XB, (7XD), (7YA), 7YG, (7ZM), (7ZO), 9ABU, 9AEG, 9AEY, 9AFX, 9AGN, (9AIF), 9ALG, 9ALC, 9ALU, 9ANF, 9AOM, 9AQE, 9ARJ, 9ASF, 9ATN, 9ATO, 9AUO, 9AVZ, 9AWX, 9AXU, (9AYE), 9AWY, 9DAT, 9DHA, 9DKS, 9DMB, 9EE, 9ED, 9EQ, 9HI, 9HT, 9IY, (9JN), 9LW, 9MC, (9NR), (9OE), 9OO, 9PI, 9PN, 9PS, 9QO, 9RG, 9SZ, 9UR, (9WI), 9TI, 9XI, 9YY, (9XM), (9YW), 9ZAC, (9ZC), 9ZU.
This is the biggest list for the past month and shows the good work done at 7ZG. This was all done on a home made set and a one step amplifier.

7BK, SEATTLE.—April 15-May 15.
Canadian 5BA, 5CP, 6AK, 6CH, 6DD, (6DP), 6DY, 6EX, (6FH), (6HC), 6IY, 6KK, 6KL, 6KM, 6LC, (6OC), 6OH, 6OW, 6PR, (6QR), (6TC), 6TM, (6TV), 6VM, (6VX), 6WD, 6AAN, 6AAU, 6AAW, 6ABM, 6ABX, (6ACR), 6ADH, 6AFV, (6AGF), 6AID, (6AIW), 6AJE, 6ALA, 6ANK, 6APH, 6ZA, 6ZH, 6ZN, 6ZR, 6ZU, 6ZX, 6ZAA, (7BH), 7BQ, 7BV, (7CU), (7CW), (7DA), (7ED), (7FI), 7FQ, 7GA, 7GP, 7HF, 7HN, 7IN, 7JN, (7JW), (7KB), 7KJ, (7LS), (7MH), 7MY, 7NL, (7NN), 7YA, 7YG, (7YS), 7ZG, 7ZI, (7ZJ), 7ZK, 7ZM.

8ANW, NILES, OHIO.
1AW, 1HAA, 1OE, 1RAY, 2RK, 2QR, 2ZL, 3XM, 4CC, 4CK, 5DA, (8AAV), 8ADJ, 8AIO, (8AKJ), 8ALY, (8AEJ), 8AGZ, (8AMF), 8ANK, (8ARW), 8AXC, 8AWX, 8AYN, (8BDP), 8BK, 8BO, 8CD, 8CH, 8DE, (8GW), 8HA, (8HB), 8JM, 8JU, 8NQ, 8OI, 8PT, 8TT, 8XE, 8ZA, 8ZG, 8ZR, 8ZW, 8ZX, 9AAW, 9AL, 9DV, 9HN, 9LA, 9LQ, 9TI, 9WU, 9XM, 9ZJ, 9ZL, 9ZN, 9ZQ.

8AUG, CLEVELAND, O.—April 15-May 15.
1AW, 1XM, 2ANL, 2BML, 2BK, 2DR, 2EL, 2FG, 2JU, 2OM, 2UK, 3AWV, 3CC, 3EL, 3EN, 3KM, 3NB, 3OU, 3PU, 3RW, 3WM, 3XF, 3XM, 4AG, 4BC, 5JD, 5ZL, 8AAV, 8ABG, 8ABZ, 8ACX, 8AGK, 8AGO, 8ANK, 8ARK, 8ATE, 8AWX, 8AA, 8AW, 8DE, 8EN, 8FE, 8KZ, 8QE, 8RQ, 8SP, 8TY, 8UI, 8WY, 8XE, 8YN, 8ZD, 8ZY, 9AAW, 9AWZ, 9JA, 9JN, 9JQ, (9LQ), 9ME, 9NW, 9PC, 9UK, 9UJ, 9UU, 9WM, 9WN, 9WO, 9ZN, NSF, WWV.

8AGZ, E. CLEVELAND, O.—C.W. Only.
1DH, 1QR, (1TS), 1XX, 2CC, 2XA, (2ZL), 2ZM, 2XQ, 2BML, (3CT), 3PU, 3AAE, 3AAO, 4GL, 4XB concert, 8BA, 8BO, 8CF, (8DE), 8GA, 8GE, 8HA, (8IB), 8II, (8IV), 8JJ, (8JM), 8JU, (8KM), 8LF, 8LV, (8OJ), (8PJ), (8QY), 8NI, 8RK, (8VS), 8XB concert, 8XK, 8XM, (8YG), 8ZL voice, (8ZG), (8ZN) voice, (8ZV), (8ZZ), 8ABO, 8ALN, 8AMM, 8ANK, 8ARU, (8ASM), 8AYO voice, (8TZV), 9XB, (9XI), (9XM concert), 9ZY, 9AZX.

8PU, ERIE, PA., April 21-May 21.
1AW, 1CK, 1TS, 1TY, 1XE, 1DAP, 1GBC, 1QR C.W., 1RAT, 2EL, 2HI C.W., 2JU, 2RK, 2UK, 2ZL C.W., 2BML C.W., 3BG, 3BR, 3CA, (3CC), 3DN, 3EN, 3HJ, 3HR, 3XM, 3AWV, 4AG, 4CK, 5DA, 8BO, 8CG, 8CP, 8DE C.W., 8DP, 8FE, 8FI, 8HG, (8HJ), (8KK), (8LM), 8LV, 8ML, 8MM, 8NB, 8NQ, 8NZ, 8OI, 8RM, 8RQ, 8SG, (8SP), 8TO, (8TY), 8UY, (8VH), 8WI, (8WY), 8WZ, 8XK, 8AAP, 8AAV, 8AAW, 8ABM, (8ACA), 8AFG, 8AGK, 8AGU, (8AHE), 8AHG, 8AIA, (8AIS), 8AKV, 8AMZ, 8ANJ, (8AOT), 8APH, 8AQD, (8AQL), 8AQV, 8ARW, 2ASJ, 8ATW, 8AUB, 8AWX, (8AYM), 9UH, 9UU, 9ZJ, 9ZN, 9AAW, 9ABJ, 9ACM, 9ALS, 9DAX. Canadian 3AB, 3BP, 3DS, 3GI, 3GO, 3LI, 3MO.

8AOY, LANCASTER, N. Y.
1AW, 1CK, 1CZ, 1GBT, 1GM, 1HTF, 1NBA C.W., 1YR, 2BM C.W., 2EL, 2XA, 3AII, 3AVG, 3CC, 3HJ, 3NB, 3PU. Canadian 3BA, 3KS, 3LD, 3MO, 8BV, 8CG, 8DA, 8FE, 8FC, 8HA C.W., 8HJ, 8IL, 8KU, 8KZ 8LB, 8MZ, 8PJ, 8SP, 8UF, 9WO, 8ZR, 8ADR, 8AGK, 8AHQ, 8AHS, 8AHV, 8AJR, 8AKX, 8AMB, 8AMM, 8AMZ, 8AMQ, 8ANJ, 8ANT, 8AOB, 8APB, 8APJ, 8ARW, 8AVD, 8AVE, 8AYT, 8BBK, 8BDH, 8BEU, 9FQ.

C. Gartlein and K. White, Florence Hall, Greencastle, Ind., April 1-May 8, Galena.
1XM, 5EK, 5FD, 5HL, 5IB, 5JD, 5YH, 5YS, 5ZD, 5ZL, 8CD, 9DZ, 8ML, 8YN, 8AGK, 8ARS, 9AV, 9EG, 9GW, 9HI, 9HN, 9HR, 9JA, 9JQ, 9KO, 9KP, 9KR, 9KX, 9LF, 9LQ, 9MC (QSA), 9NH, 9NW, 9OB, 9OE, 9US, 9QO, 9SC, 9UJ, 9UK, 9UU (QSA), 9WE, 9YA, 9YB, 9YI, 9ZJ, 9ZN, 9ZS, 9AAV, 9AAW, 9ABL, 9ACN, 9AEG, 9AGR, 9AJK, 9ALV, 9AMK, 9ANV, 9ARJ, 9AWX, 5YE, 5YL, 5ZU, 5ZX, 8ASY, 8LU, 8TK, 9AFK, 9CF, 9VC, 9WC.

C. F. BURDICK, CASPER, WYOMING, April.
5HL, 5IB, 5IF, 5JD, 5JL, 5MX, 5ZA spk. & C.W., 6AEG, 6AEZ, 6AJX, 6DZ, 6JT, 6OT, 6VS, 6ZA, 6ZB, 6ZG, 6ZH, 6ZX, 6ZZ, 7DH, 7FL, 7LU, 7LY, 7MO, 7XD, 7ZG, 7ZM, 7ZO, 8ASB C.W., 9AAW, 9ACN, 9AEG, 9AEY, 9AG C.W., 9AGL, 9AGN, 9AIF, 9ALG, 9ALO, 9ANF, 9ANV, 9ARJ, 9ASF, 9ATN, 9AUO, 9UU, 9AV, 9AVS, 9AWG, 9AXU, 9BT, 9EE, 9EL, 9FX, 9HI, 9HT, 9IF, 9JA, 9JN, 9JQ, 9KA, 9LLW, 9MC, 9NQ, 9OE, 9OO, 9PS, 9QO, 9SC, 9SZ, 9TI, 9UG, 9VE, 9WI, 9XAE, 9ZAA, 9ZAC..

Don't forget to send in your Calls Heard during the Summer months—they mean even more than in Winter.

MAY STATION REPORTS

4GN, Midville, Ga.

Steadiest	Loudest
1AW—1XF	1AW—1XF—1BZ
2RK—2EL	2EL—2RK—2DM
3EN—3GO—3YK	3GO—3XM—3EN
4XC—4CK—4BY	4YA—4CK—4DT
5YH—5ZS—5ER	5XA—5YH—5DA
8SP—8ZL—8YN	8SP—8ZR—8YN
9ZJ—9UK—9UH	9MC—9UK—9YC

4XC, Atlanta

Steadiest	Loudest
1AW—1XM	1AW—1XM
2RK—2EL—2SZ	2EL—2RK—2SZ
3GO—3HJ—3XF	3DH—3GO—3HJ
4FD—4GN—4BY	4BY—4FD—4GN
5ZL—5ZAB—5YH	5ZAB—5YL—5DA
8SP—8ARS—8ID	8ARS—8ID—8SP
9ZJ—9LQ—9UH	9MC—9ZJ—9LQ

4DT, La Grange, Ga.

Steadiest	Loudest
3VV	3VV
4GN—4FD—4AM	4GN—4FD—4AM
5YH—5DA	5DA—5IB
8SP—8CF	8SP
9AKC—9ME	9AKC—9UU

5HL, Oklahoma City, Okla.

Steadiest	Loudest
4XC—4YA—4AU	4YA—4XC—4AU
5ZX—5ZU—5ZAA	5ZAA—5ZX—5ZU
6ZZ	6ZZ
8ZY—8YQ—8ZN	8YQ—8ZY—8ZN
9QO—9AP—9MC	9OE—9AEG—9QO

5XA, Auburn, Ala.

Steadiest	Loudest
None	2EL—2ZM
3GO—3HG	3GO—3HG—3ND
4GN—4FD—4YA	4BY—4GL—4YA
5EK—5FA—5YH	5FA—5YH—5IB
8VS—8OI—8BO	8BO—8ZR—8ZA
9OE—9ZB—9MC	9MC—9YC—9FU

(Concluded on page 62)

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Who's Who in AMATEUR WIRELESS





MR. O. PSHAW

needs no introduction to our readers. He is a member of every radio club and operates many stations—when he can stay awake.

At club meetings he sits in the back row, says nothing, looks unhappy, and leaves without mixing with the gang. He always votes "aye" unless it is a rising vote which takes too much effort.

Mr. Pshaw will get his rotary gap finished about a week from some Sunday. In the meantime he uses a fixed gap. He will borrow the club's wave meter and ammeter to tune up when he gets the gap done but for the present gets along with any old antenna current.

Mr. Pshaw prefers to be called on full power as there is something wrong with his tuner. He has been wanting to repair it but doesn't seem to get the time.

Some day someone will kill Mr. Pshaw, assuming that it is possible to kill a dead one.



MR. JAY WATTBURNER

is familiar to all of us because of his theory of radio transmission. Mr. Wattburner discards clear tone, sharp tuning and clean sending as pure bunk, stating that the ether has a limited capacity, hence if signals are fed into it long enough some of them will finally drip out at 9ZN.

For years Mr. Wattburner's organization, the National Union of Tireless Senders, has attempted to saturate the ether in this way.

Their tests are disguised as calls for an imaginary station named "CQ." At present the N.U.T.S. have no station call, each man using his own call.

Why not assign them "ADF" and make each man use it?

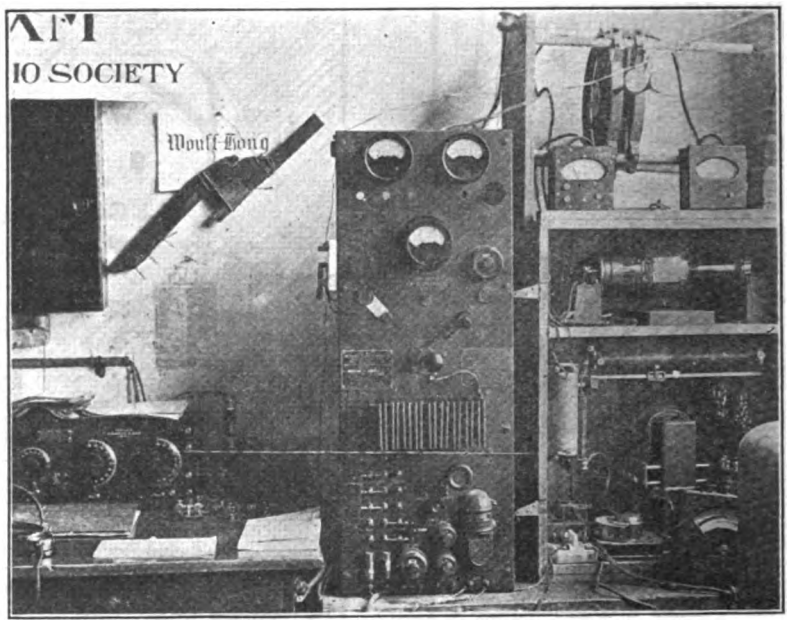
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Amateur Radio Stations



1XM, Cambridge, Mass.



Since 1XM, the station of the Massachusetts Institute of Technology Radio Society, Cambridge, Mass., is now being heard in six districts, some description of the station and the development work now going on may be of interest to fellow members of the A.R.R.L.

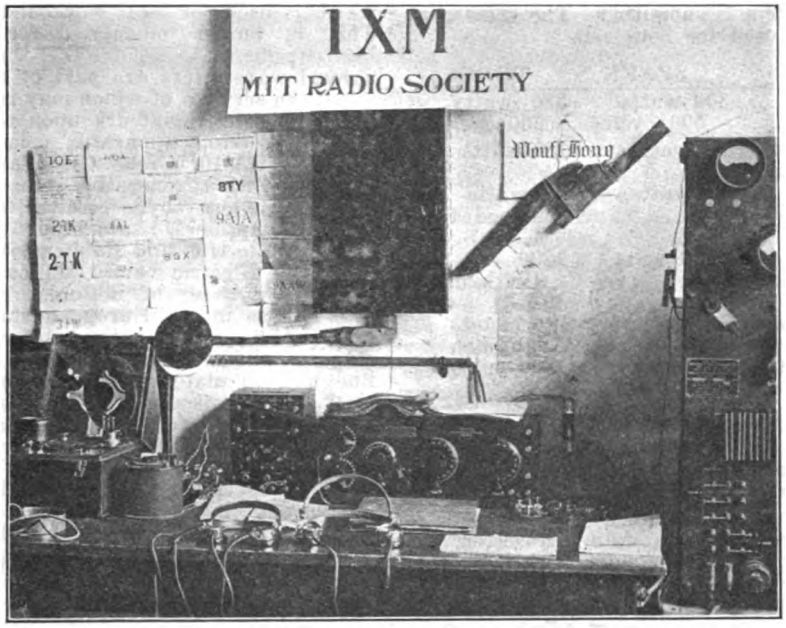
The M. I. T. Radio Society was started in 1913 in the old Tech buildings in Boston, with the call 1LC. Since the war the Society was reorganized, affiliated with the A.R.R.L., and a new station equipped in a location on Technology's Cambridge site, handy to the Institute's power house, the aerial being anchored to the top of the 200 foot chimney. The Society now has 175 members, fifty of them commercial operators who stand watches at the station with amateur operators as assistants. Men prominent in the radio field have been secured to speak at the monthly meetings and a banquet is held each year with invitations extended to all the radio amateurs in New England. The present officers are: Henry R. Kurth of Combridge, Mass., president; Carole A. Clarke of New City, vice-president, in charge of station; Fullerton D. Webster of Everett, Mass., secretary; Alfred E. Shaw of Parkston, S. D., treasurer; Edmond Bruce of Washington, D. C., chairman, station committee. According to an agreement with Technology's department of Electrical Engineering, the M. I. T. Radio Society is now a part of that department's division of research. The arrangement is such that the undergraduates still retain complete control of the station, which is to be kept in operating condition for the courses in radio communication and engineering, while the department acts in an advisory capacity.

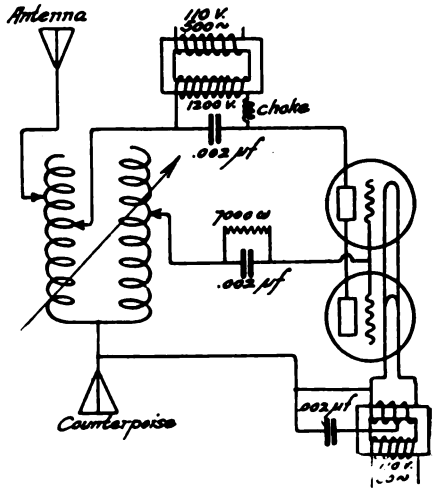
1XM's antenna system consists of an aerial rising at a 45 degree angle with the horizontal, and a counterpoise so designed as to place the anti-node directly in the transmitter inductances. The counterpoise is placed 25 feet above the earth to minimize the ground losses resulting from a

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fairly conductive soil. The dimensions are as follows: length of aerial from transmitter, 105 feet, consisting of 4 wires spaced 2½ feet; counterpoise, 6 wires spaced 6½ feet. The leads are brought through panels of insulating material fastened in the window, and on which the lightning switches are mounted. A system of antenna and counterpoise bus bars has been erected around the station so any of the sets may be connected by merely snapping test clips on the busses. Similarly a copper strip ground bus, used for receiving, runs under the operating tables. For "A" battery connections a distribution system is used so that the batteries may be kept near the motor generator and charging panel. Battery connections are made to a distributing panel from which numbered lines run to Fahnestock clips placed at convenient spots on the operating tables. The battery equipment consists of four 4-volt and two 10-volt Edison cells, and three 6-volt lead cells. Other power for operating is obtained from a 110/220 volt direct current line, a 220 volt 3 phase, and 110 volt single phase, 60 cycle a.c. mains, 110 volt D. C. motor generator supply, and a 500 cycle motor generator.

The circuit of the newest C.W. transmitter, now in use for DX work, is given herewith. 1200 volts, 500 cycles, is used on the plates of 2 Type P 250-watt General Electric Pliotrons, with a plate current of 0.25 amperes. The filaments draw 3.6 amperes each from a 60 cycle 30 volt filament lighting transformer. The total input to the tubes is 380 watts. Due to the limitations of the present 500 cycle generator it is necessary to run them far under their rated capacity. All three condensers are .002 mfd. capacity. A 7000 ohm grid leak is used with best success. A specially built Acme 500 cycle transformer furnishes the plate voltage. Signalling is accomplished by breaking the transformer input. The inductances are two pancake coils, each one foot in diameter, wound with ½" copper ribbon, and have 19 turns each. Thirteen turns are used in the antenna





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circuit, eight for the plate, and ten for the grid circuit, with two inches between the coils. All adjustments are extremely critical.

A comparison of the performance of the C.W. and the Wireless Specialty 200-watt 500-cycle quenched spark set operating under identical conditions on the same antenna system is submitted. The same generator is used for both sets.

	SPARK	TUBES
Input	300 watts, 500 cycles	380 watts, 500 cycles
Output in Antenna	93 watts	186 watts
Transf. Core Loss	21 watts	78 watts (designed for 1 kw.)
Transf. Voltage	8000 volts	1200 volts (with drop)
Efficiency	31%	49%
Wave Length	199 meters	210 meters
Decrement	0.09	Negligible
Consistent Night Range	250 miles	1800 miles

The constants of the antenna and counterpoise are as follows: capacity, 0.00054 mfd., total resistance, 10.5 ohms; natural period, 140 meters.

The constrast between the two sets is very marked in this data. However, the spark set is doing splendid work and operating very efficiently considering the input power.

In addition to the two transmitters just compared, the Society has a 1 kw. 60-cycle 3-phase Amrad quenched spark transmitter, giving the equivalent of a 180 cycle note; also a Signal Corps SCR-67 box type radiotelephone receiver and transmitter which is used for local work and concerts. This is buzzer modulated for handling local traffic. A Kolster decremeter and several wavemeters are part of the equipment, the services of which may be obtained by neighboring amateurs upon request.

The receiving apparatus consists of a Paragon RA-10, Grebe CR-2, and Clapp-Eastham ZRF regenerative receivers, Armstrong auto-heterodyne receiver, three two-stage amplifiers, numerous Brandes, Western Electric, and Baldwin phones, and Western Electric and Magnavox loud speakers. A set of deForest honeycomb coils brings in the European stations and a deForest jeweler's time set with two-stage amplifier is connected to a telephone line and regulates the Institute's master clock. A loop is used for direction finding.

1XM is open for traffic regularly from 9 p.m. to 6 a.m. Tuesday, Thursday, and Saturday. On other nights a watch is usually kept from 8 p.m. to midnight. A first grade commercial operator is in charge at all times. The division of time as

(*Concluded on page 61*)

5XA, Auburn, Ala.

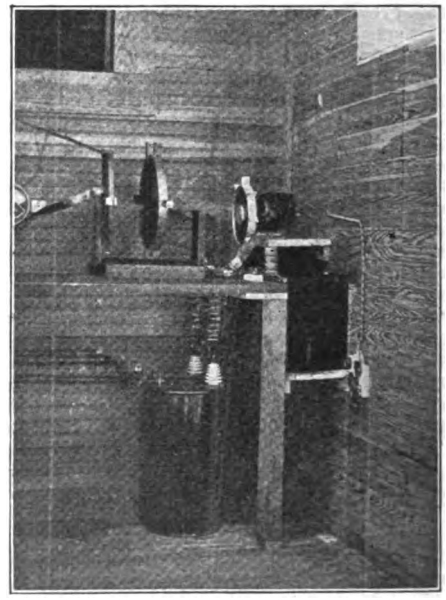
The noise-maker of the south, Alabama Polytechnic Institute, Auburn, Ala., is here portrayed.

5XA has a peach of a mast, 140 ft. high, of steel pipe, and two aerials, one a 4-wire stretching away for 550 ft. to a 120-ft. tank, and the other a 7-wire nearly vertical one, 130 ft. long, on which the short-wave work is done.

The receiving equipment consists of a Radio Apparatus Co. long wave set and a home-made regenerative for short-wave work, on which about everything is heard from 1AW to 5ZA. An SCR-55, used as an amplifier, can be thrown onto either receiving set. VT-1's are used thruout.

A college-made power panel is at the right-hand end of the operating bench, and to the right of it the transmitter is located. This consists of a 2 KW Packard transformer, Dubilier special condenser, Hyrad disc revolving 3600 r.p.m., and a pancake O.T. Since this photo was taken a new O.T. using 2-inch ribbon and mounted on hinges on the wall has replaced the one shown, incidentally shortening the closed-circuit leads also.

(*Concluded on page 62*)



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Anouncement has been received of the marriage of Miss Mildred Josephine Finn to Mr. Ralph Howard Groves Mathews, 9ZN, A.R.R.L. Central Division Manager, on April 23d in Chicago. Our phone diaframs barely stood up under this news, but we are sure the whole amateur world joins with us in hearty expression of good wishes for a long and happy wedded life to Matty and his little lady.

1HAA is no more. Vermilya is now 1ZE, using 200, 250 and 375 meters.

Wouldn't it be wonderful if Kruse owned a lunchroom?

We print the following from the May issue of "Radio News", excerpted from a story by "G. Ridleak":

"... A friend of mine who also gives a weekly wireless concert confines himself to organ recitals. He plays these on a thing which believe is called the "QRT". This instrument, or whatever it is, is said to be the official organ of the Awful Racket Raisers League. From what I've seen, it sure takes a lot of wind to run an organ."

We wish we might also print the letters we have received from indignant A.R.R.L. men. But it really wouldn't do. We leave it to the amateurs of the country to form their own judgment.

In that "$100 C.W. set", and others as well, it is advisable to use a separate transformer for heating the filaments. Then the filament voltage can be controlled by a rheo in the primary of the filament transformer if desirable and, as a big improvement, the key can be placed in the 110 v. circuit of the plate transformer.

Henry Klaus, 9AK, had a little accident recently, burning out all the tubes in his radiophone. Guess how many? Well, Henry figures that if it had been only four tubes or so it wouldn't have been half bad. The horrid truth seems to have been that there were thirteen of 'em in parallel and they simultaneously exhibited Dr. Goldsmith's "discouraging decisiveness" and went up the flue together! Oh mamma!

Paragraph 86, page 58 of the 1919 edition of the radio laws has been repealed as of July 1. This was the paragraph that formerly gave authority to operate a station while awaiting receipt of a license.

The Somerville Radio Laboratory have added to their line of meters a model JX, 0-15 volt A.C. voltmeter, especially intended for the filaments of power tubes heated by A.C. The desirability of using voltmeter vs. ammeter is recognized but there have been no small scale A.C. voltmeters heretofore. The JX should completely fill this need.

9YA has a calibrated receiving set and will be glad to advise the correct wave length of anyone with whom they work.

The formation of a radio fraternity is announced at Coe College, Cedar Rapids, Iowa, with a chapter at Iowa City also. It is known as Alpha Delta Alpha. Information can be obtained from Paul A. Young, Radio Engineering Dept., Coe College.

On the night of April 19 last the C.W. signals of 8LF, W. K. Thomas, 17 Emerson Ave., Crafton, Pa., were copied by Jack Stevens, 6AOY, Avalon, Calif. Mr. Stevens reports the signals "normally loud—about the same as XF1 and 8XK". 8LF was using four Radiotron U.V.202's, putting 2.4 amps. in an antenna of about 8 ohms resistance, equivalent to an output of about 46 watts. Both participants in this C.W. record are to be congratulated.

On the night of May 14th when auroral disturbances had wire service completely tied up, 1AW undertook to get the Associated Press service from New York for "The Hartford Courant". It was realized that no station outside daylight range was likely to be heard and 1AW simply sat thru a long blank period until finally 2EL was heard. 2EL is Mr. H. H. Carman of Freeport, L. I., one of our best stations. 1AW succeeded in raising him and explained what was wanted and 2EL, after first being told by the New York officers of the A.P. that the wires were O.K., finally secured the news from them by telephone and passed it on to 1AW, where it was rushed to the newspaper office. Thus was

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another good job put over for Citizen Wireless and Mr. Carman has our thanks and congratulations on his persistency and success.

A decision of far-reaching importance has just been rendered by Judge J. M. Mayer in the United States District Court in a suit brought by Edwin H. Armstrong and the Westinghouse company against the deForest company. The suit was brought for alleged infringement of the well-known Armstrong circuit patents and the judge's decision broadly sustains the patent and holds it to have been infringed.

The Armstrong patents in question are the so-called "feedback" patents, covering almost any method by which part of the plate circuit energy may be returned to the grid circuit to reinforce the action, and apply to regenerative or oscillating receivers or tube transmitters, whether capacitive or inductive feedback. Mr. Armstrong, and the Westinghouse company by virtue of rights acquired from him, therefore are recognized as having the sole right to the use of the oscillating circuits employed today.

In his decision Judge Mayer paid great tribute to the imagination, clearness and accuracy of thought, perseverance and extraordinary ability of the inventor, incidentally dubbing him "Feedback Armstrong."

In the "Wouldn't it be wonderful—" column of this section in May QST a disparaging reference was made to the ability of the operator at WHE. There is but one operator at WHE, Mr. J. W. Harte, and we have convinced ourselves that he is a very good operator, rather than a poor one. Whereby, of course, a big injustice was done Mr. Harte and we take this means of offering our humble apologies.

On the value of radio frequency amplification: "The effect of amplification of the radio frequency currents is proportional to the square, while amplification of the audio frequency current gives an effect proportional to the first power. If a weak signal is amplified 20 times before it is applied to the detector tube the resulting audibility will be as great as would be obtained by applying the signal to the detector tube directly without amplification and then amplifying it 400 times.—"The Log" (Third Naval District).

No, Oswald, the airplanes don't drag a wire on the ground to make their earth connection—they use a counterpoise.

The Bite of the Wireless Bug

By Peter Deets

The wireless bug of which you've read has bitten me, that's clear; no serum treatment yet devised can help me now I fear. At first I had a simple set, loose coupler and receivers, detector of galena stone, take note you unbelievers. It worked and each and every night, (the effect of the bug increasing), I'd try to understand the code. My efforts were unceasing.

Now and then I'd catch an "o", and "i's" I got with ease. The signals weren't so very good, just loud enough to tease. In order to increase them, I got a two stage set. The code and music now are great, it beats a "Vic" you bet.

Oh! when I think of all the time I've spent in crystal gazing, in search of useful spots thereon, in truth it is amazing; and some day in the years to come when I have learned the code and when I get my license I'll write another ode, and tell you all about the joys, as would old Epictetus, of how it feels to have a case of genuine "Wireless-itis."

They tell us there are a flock of operators on the U.S.S. Tennessee who believe it utterly impossible that amateurs with their limited power could be able to handle the Transcons as we know we did. In fact, it is intimated that the gentlemen believe our story is pure fiction. It would be if we had as much trouble making our sets reach out as the Tennessee does in trying to cover 200 miles with her 10 KW.

XG1 is the U.S. Army Balloon School at Lee Hall, Va., about 20 miles from Newport News. The CW set is an SCR-67, and the spark set an SCR-73.

From the LaCrosse, Wisc., Tribune:

"Citizen's Comfort Considered"

"Wireless Amateurs of England and America will endeavor to get in communication with each other on February first. The operations of the American amateurs are handicapped by Government restrictions. In order that the operation shall be conducted with as little annoyance to the outsiders as possible, a new garage has a sound proof room in which the horns are to be tested."

What the hexx!

David Sarnoff, commercial manager of the Radio Corporation of America since its organization, and for fifteen years connected with the Marconi interests, has been appointed general manager of the corporation; and E. P. Edwards, for a number of years assistant manager of the Lighting Division of the General Electric Co., has been appointed in charge of engineering, manufacturing and sales.

Our idea of nothing to do: Listening to somebody's radiophone concert.

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THE A.R.R.L. has the pleasure of announcing the ratification of affiliation of the following additional societies, as of June 4, 1921:

Maryland Radio Assn., Baltimore, Md.
Southern Ontario Radio Assn., Windsor, Ont.
Wireless Assn. of Pennsylvania, Philadelphia, Pa.
Staunton Radio Club, Staunton, Ill.
Wireless Assn. of Ontario, Toronto, Ont.
Hill City Radio Club of the Summit Y.M.C.A., Summit, N. J.
Stoneham Radio Assn., Stoneham, Mass.
Premier Radio Club, Grantwood, N. J.
Manhattan Assn. of Radio Scouts, New York City
Radio Research Assn., New York City
Waco Hertzian Society, Waco, Tex.
Community Radio Club, White Plains, N. Y.
The Radio Assn. of Salem, Salem, Ore.
Collegeville Radio Club, Collegeville, Pa.
University of California Radio Club, Berkeley, Calif.
Radio Club of the Bronx, Bronx, N. Y. C.
Napa Amateur Radio Club, Napa, Calif.
Peninsula Radio Club of San Mateo, San Mateo, Calif.
The Mt. Sterling Radio Assn., Mt. Sterling, Ill.
Laconia Radio Club, Laconia, N. H.
Peoria Radio Club, Peoria, Ill.
The North Shore Radio Club, Chicago, Ill.
Triangle Radio Society, Rochester, N. Y.
Yonkers Radio Club, Yonkers, N. Y.
Radio Club of the Y.M.C.A. of the Oranges, Orange, N. J.
Tech Radio Club Oakland, Calif.
The Maplewood High School Radio Club, Maplewood, Mo.
Y.M.C.A. Radio Club of Rome, Rome, N. Y.
Fordham Radio Club, Bronx, N. Y. C.
Ottawa Amateur Radio Assn., Ottawa, Ont.
Rubber City Radio Club, Akron, Ohio
Ft. Worth Radio Club, Ft. Worth, Tex.
Northwestern Indiana Radio Assn. Hammond, Ind.
Westfield Radio Assn., Westfield, Mass.
Brockton District Radio Club, Brockton, Mass.
Mystic Valley Radio Club, Malden, Mass.
The Ypsilanti Radio Assn., Ypsilanti, Mich.
The Limited Radio Assn., Chicago, Ill.
Radio Club of the Carnegie Inst. of Technology, Pittsburgh, Pa.
St. Paul Central High School Radio Club, St. Paul, Minn.
University of Virginia Radio Club, University, Va.
The Conneaut Radio Club, Conneaut, Ohio
Scenic Highway Radio Club, Clinton, Iowa
Fall River Amateur Radio Club, Fall River, Mass.
Regina Amateur Radio Assn., Regina, Sask.

National Convention

At the First National A.R.R.L. Convention at Chicago Aug. 30—Sept. 3 important discussions of co-operative measures, club organization and activities, community work, etc., are scheduled. These will be of high interest to all forward-looking clubs and we suggest that as many societies as possible arrange to have at least one member attend the convention to partake in the discussions and secure ideas that will undoubtedly be worthy of local application. In other words, everything that clubs are interested in is going to be up for discussion at these meetings and it's going to be worth while to have a representative there to soak up ideas and report, if nothing else.

Here's Co-operation

The radio clubs at Washington, Baltimore and Hagerstown are having a series of get together—get acquainted meetings that already have eliminated all petty local differences and have done much to cement that locality into a smooth-working unit.

The first meeting was held at Washington on April 22d under the auspices of the Washington Radio Club, Mr. S. Kruse presiding in the absence of Mr. H. H. Lyon, president. About 125 were present.

A remarkably simple radio recorder was exhibited by Dr. E. A. Eckhardt, of the Sound Section of the Bureau of Standards. Using but two VT-1 (Western Electric J) tubes and an average amateur antenna this device recorded on paper, perfectly, the signals of YN, WII, and WSO through medium static.

Several men from each of the three cities told of the operating conditions and schedules followed in their own localities and how the stations in the other cities were heard. A great deal of very interesting information regarding the possibilities

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of regular relay routes between Baltimore, Hagerstown and Washington, which heretofore have not been in regular communication, was obtained.

After the formal meeting dinner was served at the Canton next door. Everyone ate all they could and enjoyed greatly talks by L. C. Young of NSF; S. Kruse of WWV; E. B. Duvall, A.R.R.L. A.D.M., of Baltimore; S. W. Piper, vice-president, and E. A. Green, secretary, of the Hagerstown club and several other prominent amateurs. The meeting was a great success.

The Washington and Hagerstown radio clubs, and representatives from clubs in Martinsburg, W. Va., and Waynesboro, Pa., were guests at a co-operative meeting and banquet given by the Maryland Radio Association, of Baltimore, at the Caswell Hotel at that city on May 17th.



Washington—Baltimore—Hagerstown Meeting, May 17.

The Baltimore meeting proved to be one of the most lively affairs held in the Third District since the Convention in Philadelphia last February. Addresses were made by Mr. L. C. Young of NSF, Mr. Henry Lyon, president of the Washington Radio Club, Mr. S. Kruse of the Bureau, R. E. Linthicum, V.P. of the Washington club, E. B. Duvall of the "Radio Condenser" staff, and E. R. Bateman, president of the local club.

The business of this meeting was devoted to suggestions for the arrangement of DX schedules for the summer months between these cities, both for daylight and evening working. At the close of the business meeting a banquet was served for the eighty-five present, and to keep the diners in a happy mood snappy music was rendered by an Hawaiian orchestra which, to put it lightly, did do things up brown.

This meeting was one big success and accomplished this if nothing else: a friendly feeling and the assurance of co-operation by everyone present.

The third meeting of the series will be held soon.

The Radio Club of the Bronx

The Radio Club of the Bronx was organized in 1920. For a few months it struggled along on its charter membership unable to grow because of the lack of facilities. After merging with the R.R.C. to form one strong organization, we incidentally acquired a large meeting room and an operating room in the Bronx Y.M.H.A.

At present we can accommodate a much larger membership. To those who wish to join we extend every advantage associated with a strong and growing radio club. We cordially invite visitors and promise a pleasant and enjoyable evening to those interested enough to attend any of our meetings.

The club set at present is undergoing repairs but we hope in the near future to institute an operating schedule and become a link in the great chain of relay work that is being done in the Bronx.

The newly elected officers of the club are Sam Ellner, pres.; Nat Sauberman, secretary; and Michael Levine, treasurer. Kindly address all communications to the secretary—789 East 163rd St., Bronx, N.Y.C.

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Radio Communications by the Amateurs



The Publishers of QST assume no responsibility for statements made herein by correspondents.

C.W. QRM

2637 Garfield St., N.W.,
Washington, D. C.

Editor, QST—

It has been brought home of late to those of us in the operating game that CW transmission has possibilities for creating interference that we had not anticipated. It is true that straight CW is very sharply tuned and that a comparatively large number of CW sets may be operated in close proximity without interference if the proper receiving apparatus is used. There are several variations from this ideal condition when CW is put into operation. In the first place, very few of us transmit CW. We modulate intentionally with buzzer, voice, or by an alternating plate power source, or unintentionally by commutator hums or electrolytic rectifier noises. All of these things, especially voice modulation broaden the wave and cause it to depart rather widely from the ideal sharp tuning. Some of this interference can be avoided by carefully filtering out commutator noises and using pure CW in place of commutator or otherwise modulated CW. The telephone is inherently broad tuning, and for that reason, to me an obnoxious perversion of the CW set.

There is another type of interference which is due to oscillating receiving sets which are used in CW work. Each of these sets, if operated autodyne, is a moderately good transmitter capable of creating considerable local interference, especially when several operators are listening to the same sending station and hence are radiating unintentionally on about the same wave length. We have found it quite possible to send for a mile or so by using the receiving set as a CW transmitter. It follows that we can create considerable interference over at least the same range. This nuisance has already become a practical operating difficulty in Washington and if the much announced conversion of amateurs' transmitters to CW should become a fact, we are likely to be operating under difficulties that will make our late spark interference seem tame by comparison.

Will not someone suggest a type of receiving set which when used for CW reception will not radiate and yet can be handled with sufficient ease so that a CW set may be followed through its wave length variations? The same operating difficulty has led to the use of the separate heterodyne in Europe. It would seem most unfortunate that we should complicate our sets in a similar manner.

Sincerely,
S. Kruse.

RECEIVER CIRCUIT DESIGN

104 West 49th St.,
New York City.

Editor, QST—

Have read with interest Mr. Hatry's letter on page 58 of the May QST in which he presents a simpler regenerative circuit than any of those given by the writer in the March QST.

For about nine months, just after the ban was lifted, the writer experimented with nothing other than single-tuned receivers, and tried about every circuit that came to hand that looked anywhere near feasible, and some that could well be used as monuments to the deviser's imagination. Over twelve receivers were actually assembled and built employing some different form of tuning or regeneration, while there is no complete record of number or circuits that were tried. However, after getting one out of the lot that seemed the best, it was given a careful test against a loose-coupled variometer set, with discouraging results.

Mr. Hatry's circuit was tried among others, and despite a trial of different inductances, condensers, etc., it was found that to cover the range Mr. Hatry attributes to it, all four adjustments had to be carefully juggled, while to work from about 180 to 300 meters, the antenna inductance had to be varied, as well as the capacities, while the plate inductance was left at a fixed value. This left three adjustments, and when compared with the three in Figs. 1 or 2, as given by the writer, the single-tuned set showed a woeful lack of selectivity, and was extremely critical in adjustment for phone reception.

The antenna used in this test was a very short single-wire of low capacity, and it was noticed that good selectivity was only obtained, as Mr. Hatry states, when the antenna series condenser was set at very low values, in the writer's case from about 50 mmf. to 250 mmf.

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However, for constructional cost, Mr. Harty's set has it all over the writer's, and works very well where there is less QRM than in and around New York.

A very good single tuned set may be constructed with only one condenser, using the tickler circuit. In this case the condenser is used in the ground lead, regeneration being obtained by a tapped tickler tightly coupled to the antenna inductance. The antenna inductance should be tapped every ten turns, and the tickler every three after about 20 turns, with enough wire used to cover the desired range of wave lengths. This set has the advantage of no moving coils, and only one condenser, and operates very nicely, even on phones.

Capacity tuning of the plate circuit is not entirely satisfactory for several reasons, one of which is that the condenser alone does not always permit a zero regeneration adjustment. Take for instance a case where for a given station a large inductance is used in the plate circuit, with a correspondingly small shunt capacity. If we then try to shift to a weaker station on approximately the same wave, the condenser, even at zero, may not be low enough for best regeneration. This means that the inductance must be reduced, the condenser reset, and the antenna condenser probably reset, and yet if we try to shift the regeneration by the shunt condenser alone, it is probable that good results will not be obtained. However, this trouble is not confined to single-tuned sets alone, and should be considered when designing any type of tuned plate set.

The writer hopes Mr. Hatry will not be offended by this comment, as he probably realizes the faults of single-tuned sets as well as anyone else, and knows that they cannot be compared to sets designed as carefully, only with inductive coupling.

With best regards, I am,

Yours very truly,
McMurdo Silver.

UNRELIABLE STATIONS

Marion, Mass.

Editor, QST—

Just a word about "Spasmodic hams". We have them all around me. For instance, where are all the hams and official relay stations in Fall River and Rhode Island the last many weeks? Also Martha's Vineyard, and several other nearby places?

I have messages on hand for all these birds. In their succession, they will come on the job every night for two or three weeks, when there is nothing on the hook for them, causing all kinds of careful tuning to work around them. Then when messages arrive, they are off the job for a month at a clip and the messages must be mailed.

This is no fading or poor radio weather for they are all well within range when on the job. No monthly reports have ever been received from any relay station as long as I have been D.S. for So. Mass., and what I turn in is gathered by observation only.

How come such stations exist at this late day of advanced Citizen Radio? What are we going to do about it? Shall we consider them dead and never forward them a message whether they are on or not, or shall we just forget it and put them down on our list as "inactive spasmodic radio stations" with which radio communicaton is unreliable?

Very truly yours,
1ZE.

GOOD WORK ON CRYSTALS

1619 Grand Ave.,
Connersville, Ind.

Editor, QST—

I write to tell you about a crystal detector set which has done very good work in recent months.

The set was installed in February and consists of a balanced type galena detector, five hand-wound honeycomb coils, a shunt and a series variable condenser, two pairs of phones, and a fixed condenser. The aerial is a single wire 125 ft. long, 35 ft. average height, within a few feet of the branches of four trees. The ground is three water pipes connected together and then joined to the set by a wire 30 ft. long. The set was intended to receive time signals but amateurs and commercials were also heard. For amateurs, two single-layer H.C. coils in series with the series condenser were used, while a 12-layer coil and shunt condenser were used for Arlington. After a little practice in adjusting the detector very good signals were received and as we became more skilled our range rapidly extended until we heard NAB, NAE, NAR, NAS, NAT, WNU, NGL, WLC and others. Of the amateurs we have heard from the 1st, 3d, 4th, 5th, 8th and 9th districts, including 1XM, 3DH, 3YE, 4AL, 4XC, 5MF, 5BM, 5HL, 5HV, 5HY, 5IB, 5YH, 5JD, 5ZD, 5ZL, 5ZX, 5ZU, 8WC, 8ZW, 9ABU, 9AEG, 9GW, 9YI, 9YB, 9LO, and 9ZC.

Some freaks have been experienced, the most notable being the reception of signals from 9ABU, Carrington, N. D. He was heard sending CQ's and a letter to him brought the reply that he was sending at the time heard but using only 60 watts on a Ford coil and about ¼ amp. in the aerial. But freaks are exceptional, as stations like 5HL, 5YH and 9AEG have been heard clearly nearly every night.

From this it is obvious that exceedingly good work can be done on a crystal. The only essentials are fairly good crystals,

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patience in adjustment, and careful listening.

I would be glad to hear from other amateurs who are doing good work with this kind of a detector.

Yours truly,
Carl W. Gartlein, 9DQD.

LOSSES IN "A.C." C.W.

Mass. Inst. of Tech.,
Cambridge, Mass.

Editor, QST—

The popular tendency of late in A.C. vacuum tube transmitters is to avoid the usual rectifiers by the use of the so-called self-rectification systems of using a separate oscillator for each half cycle.

I have taken careful measurements of the characteristics of this system and am disappointed in the large losses occurring in the tube not in immediate operation.

I would like to point out the following concerning the transformers utilizing the secondary centre tap for connection to the filament junction and grid bias.

At a given instant, the centre tap is negative in respect to one outer terminal. At the same instant it is positive in respect to the opposite outer terminal. It necessarily follows that this centre tap is neutral in respect to both terminals. This means that the tube note developing oscillating energy has a negative charge on the plate and a POSITIVE grid charge. This results in surprisingly large losses of oscillating energy by passage of current from this grid to the filament. Fortunately, the phase relation is so disturbed that the transformer input decreases and the losses are not as great as one would at first suppose. Nevertheless, the input-output ratio of such a system has discouraged its use at the station of the M.I.T. Radio Society.

Our available time for experiment is extremely limited and I would appreciate together, I am sure, with many other experimenters any information on this topic published in the pages of QST.

Sincerely,
Edmond Bruce.

OUTTA SPIRITS

Richmond, Virginia,

Dear Eddy:—

Say, OM, where do they get that stuff Ouija is all wrong? I owe my life to that bird for several reasons which I am going to set forth in this horrible example of narration.

To begin with, my spark had never been heard outside of the city limits, even though it was a full grown 1 KW with a radiation of 1.4 amps. using the best ground I could get. Hooked myself onto the city water mains, buried wires, strip, etc. I could not make a soul hear me even though I used up about $17.43 worth of juice per month and the Power Co. sent up to test my meter voluntarily for "high bill". Well I had almost given up in despair, cussed those birds who said they sent thousands of miles on 1KW, laffed loudly at those who said they got 8 amps on 1 KW, etc., as the greatest flicker I could get was 1.4 on a big meter.

I dropped around to a girl's house one night recently and the gang were there playing Ouija Board. Now, I am very very skeptical regarding talking with spirits, especially this time of the year as my stock is about all out now. But they harangued me to ask the thing a question, swearing it would answer. So as radio was prominent in my mind and the girls operating the thing didn't know anything about radio, I thought here is a chance to QRT Ouija in our locality. So I asked it would a ground or counterpoise aid me in furthering my distance. It answered 'counterpoise'. So I began to sit up and take notice. Then I fired another, asking how long, and it told me and after a fifteen minute session with it, it had given me complete description of the counterpoise, how to insulate it, how far off ground to put it, the number of wires, etc. Then I asked what radiation should I look for and it said five amperes. Then I asked it to give me the call letters of several friends and it just naturally faded the Government call book out entirely. So I say this Ouija bird must be T.O.M. himself. After getting all the dope I went home and slept on it. The more I thought abt it the more convincing his argument was, and I didn't have my hands on the board at all. Just a coupla Janes working it.

The next day was Saturday and as I took a half-day off I bought the stuff for the counterpoise and went home and put it up. After getting it up and disconnecting the ground, I pressed the key and the hot-wire meter took a healthy flicker and went over to about 5 and I took my hat off then. The gang in town reported me very much more QSA and I went home and ate supper and the first night I listened in after I put the counterpoise up I worked 3BZ, a distance of 150 miles, who reported me QSA. This was the first time I had ever worked out of town on the set and the "Combination" was found. Have since received several letters and cards reporting my spark QSA in nearby cities and I hope to get further by adding more wires to the counterpoise. Now don't think I am in the same class with the fellow who reports he was arrested for being crazy—talking in a radiophone and the neighbors sent a cop over because he mumbled to himself (seemingly) all the nite.

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If I am heard any more it's due to that confounded Ouija and let me say a word right here in its behalf.

"IF YOU WANT DISTANCE AND ADVICE, GET A OUIJA BOARD".

It has Dr. Radio, Zenneck, T.O.M., M. B. West and all the other dopesters beat a mile; although I am firm believer in all of the above, I am for the Ouija without exceptions. I accept the nomination.

Now you can either believe that or not but T.O.M. has good food for thought in one of his "rotten" arguments by naming it "Rotten Ouija Dope."

Got to go now, spilled enough for this time. Take it or leave it, the counterpoise is there to stay. If Hertz's spirit told me to stick up the counterpoise, I thank him, for it sure did prove a revelation to me.

CUL and lets hear what the gang has to say abt this.

73's

C. D. Blair, 3ZL.

TRANSMITTING ON VT-1's.

92 East Franbes Ave.,
Columbus, Ohio.

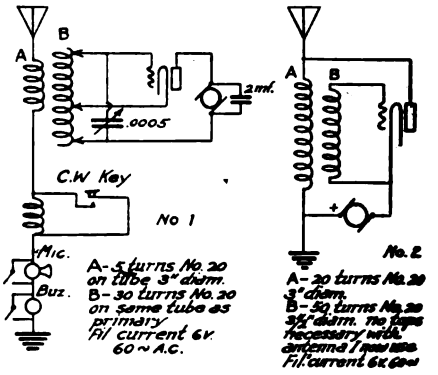
Dear Mr. Warner:

In regard to my low powered C.W. set you recently inquired about. It used only a VT-1 receiving tube that I was fortunate enough to get a hold of and surely proved itself a wonder.

I received letters from Mr. Furrow, 8FT, of Troy, Ohio, and Mr. Endley of Mansfield, Ohio, 8ZR, both saying my CW signals came in fine. Stations up to ten miles reported my buzzer modulated and voice readable at quite a distance from the phones, one station even reported buzzer and voice readable over the entire floor of his house. The distance to Troy and Mansfield is between 60 and 65 miles, the straight CW sigs only being readable there. What seems the most remarkable part of it, is that all the work was accomplished with an antenna only 20 ft. high, a single wire from the back porch to a nearby telephone pole about 60 ft. long. There were numerous large buildings very close which do not help matters any.

I used an old 500 volt motor, which gave about 500 volts when driven as a generator at normal speed, although voltages as high as 600 have been obtained without undue overload. 500 volts is about as high a voltage as the VT1 bulbs will stand without blueing over and excessive heating. When working at exactly 400 volts and with a filament current of 1.2 amp. I got a radiation of 400 milamps. I generally work the voltage at 375 volts as I believe the tube will have a longer life.

I am enclosing two circuits with constants which I have used with equal success with the VT-1. Circuit No. 2 seems to work better with the Marconi bulbs and not require a very critical adjustment of turns, ten turns in the primary does not affect radiation in the least. It seems very queer but is an actual fact. Am able to put about 350 milamps in the aerial with one Marconi bulb. 400 volts on plate.



I used 110 V. AC supply stepped down with a toy transformer to light the filaments.

The above work was all accomplished during the daytime. Have worked with 8FT—62 miles at 1 P.M. and 8ZR heard my sigs at 5 P.M. so you see I must have had quite a little range at night.

Sincerely yours,

Robert C. Higgy, 8IB.

ARTISTIC REPORT POSTCARDS

711 W. 23d St.,
Austin, Tex.,

Editor, QST—

It is the general practice among amateurs to let others know how their signals are "coming in" and this is often done by means of postal cards.



FIGURE 1

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Some amateurs have cards printed, but this involves too much expense for the average "radio shark".

A very serviceable card stamp may be made by cutting the call letters out of some material such as an old inner tube, and then gluing them to a block of wood. The letters of course must be reversed as in Fig. 1. After the glue has dried all of the letters may be made the same thickness by rubbing the stamp block on a piece of fine sandpaper. An ordinary stamp pad will serve to ink the stamp.

Yours sincerely,
Geo. E. Endress, 5JA.

PAGE MR. GROVES.

Mercer, Pa.,

Editor, QST:—

"A Novice" certainly raises an interesting point when he asks in the January QST why we do not hear more from the amateurs on the performance of the honeycomb coils. We are all interested in the fine work Mr. A. L. Groves has done, but we would like to know whether any one else has had his success with these coils. I have read Mr. Groves' articles attentively, and he has been kind enough to write me several letters in an endeavor to get me into the straight and narrow path, but up to date I have not been able even to approximate his performance. While giving Mr. Groves full credit for his wide experience and undoubted skill, I am inclined to think there is something very favorable in his location. There seems to be regions that attract radio waves that have passed over other territory with seeming contempt. Every radio situation is to a great extent a law unto itself. An aerial and an equipment that will give a certain result in one place will not duplicate that result in another in all cases. It looks as if the tuning of honeycomb coils for long distance reception were almost an art by itself; but it is one well worth pursuing, for success in spite of difficulties is a reward worth having.

Mr. Novice's experience has been astonishing. He tells us that his coils perspired profusely and that the water literally dropped from them. Now, I have labored some with these coils, and I can testify that in my case it was the operator that did the sweating. I fear that Mr. Novice's locality is very wet and needs the attention of the prohibition enforcement officers.

But testimony is what is wanted, so I shall proceed to detail my experience with the honeycombs. Aerial 116 feet long and 62 feet high; 6 copper cables spaced 26 inches apart. Last February I got two coils of 1200 turns each and one of 750 turns. These I mounted on a straight rod. I usde one audiotron and Holtzer-Cabot receivers. As to results: I heard the Atlantic coast stations, Mexico City and sometimes San Diego, Calif. Of the stations on the other side I heard POZ many times, YN once and MUU two or three times; all nicely readable. As spring advanced I had frequent engagements with King Static, and was finally routed and driven from the field. This winter I got the coils out again, and purchased a number of others. The latter were mounted on plugs. I also mounted my original three on plugs so all could be used on one of the hinged mountings. Now the strange part of the story is that although I am using the same aerial, the same tube, the same 'phones and the same coils (and more) that I used before, I do not hear any European stations at all. Why is it thus? I do not know.

I have been after the CW stations exclusively and have used the tickler circuit. I have no duplicate coils except the two 1200's. It is with these two, using the 750 for a tickler, that I have had my best results. Perhaps if I had more duplicates, I should have better success. NPL XDA and the Canal Zone are as far as I have penetrated this season. I get NPL by using two 1200's with a 750 as a tickler, and the secondary condenser (.001) set at 54. I can hear WSO almost any way, without primary and aerial connection. But the signals come from the aerial just the same. I can place one hand on the aerial binding post, and, by using the other hand as a primary, get greatly increased signals from WSO. It is probable that a 23-plate condenser in shunt to the secondary would work better than a 43-plate, as it would allow greater freedom of movement in making adjustments.

From the above it will be seen that neither my success nor my activities have been great. I intend, however, to get more ammunition and continue my campaign against Europe, hoping for a set of coils that will enable me to hear the ex-Kaiser groan as he confesses his sins.

S. F. McCartney.

CORRECTION

Thru our error the advertisements of Radio Testing Station in May and June QST quoted their aerial wire "per 100 ft., 58c; per 100 ft., $5.50." The figure of $5.50 is the price for 1000 ft.

1XM, CAMBRIDGE, MASS.

(*Concluded from page 52*)

agreed upon by the Greater Boston Executive Council, on which the Society is represented, will be strictly followed.

During the month of April 1XM handled 171 messages, worked forty stations outside of the first district, and has copied 124 DX stations. 5ZA, 4YA, and 4BY

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have been copied and the last mentioned also worked. 2DN, 2BK, and 2OW have been easily worked after daylight.

The Society is indebted to the Acme Apparatus Co., Atlantic Radio Co., Radio Equipment Co., Clapp-Eastham, W. J. Murdock Co., General Radio Co., and American Radio and Research Corp., for their co-operation.

Communications should be addressed to the M. I. T. Radio Society, Box 160, Massachusetts Institute of Technology, Cambridge 39, Mass., or telephoned direct to the station.

OPERATING DEPARTMENT

(*Concluded from page 45*)

ful attempts to arrange schedules with Hagerstown stations; they are unable to receive Washington regularly account bad induction. During the recent aurora disturbance, many nights passed without Washington stations hearing any but Baltimore stations. This is phenomenal, as the signals were strong and steady, whereas normally night communication between these cities is almost out of the question.

It is hoped that the good work of the numerous DX men in the District of Columbia will continue thruout the summer, and there is every indication to this effect. The use of straight C.W. is showing itself very effective in maintaining communication under adverse statc conditions, the chief difficulty being inability to raise stations other than those with whom schedules are pre-arranged.

Reported messages, 1519.

MAY STATION REPORTS

(*Concluded from page 48*)

5ZU, Austin, Tex.

Steadiest	Loudest
4XC—4GL—4YA	4XC—4GL
5XB—5YK—5ZA	5XB—5YK—5ZA
6ZZ	6ZZ
8ZZ—8YN—8ZY	8ZZ—8ZY—8YN
9AEG—9LR—9EL	9EL—9AEG—9OE

7DA, Portland, Ore.

Steadiest	Loudest
Can. 5BA—Can. 5CJ	Can. 5BA—Can. 5CJ
6ZU—6AH—6KA	6ZR—6ZU—6AH
7YA—7BK—7FI	7YA—7FI—7BK

7ZM, Moscow, Idaho

Steadiest	Loudest
None	5ZA
6ZR—6ZX—6AGF	6ZR—6AH—5OC
7YA—7CU—7ZJ	7YA—7YS—7CU
9AGN—9LW	9AGN—9LW—9AEG

9YB, Purdue University, Lafayette, Ind.

Steadiest	Loudest
None	8XM—8YE—8YA
None	4YA—4AG
5EK—5YH—5DA	5DA—5YH—5EK
8ZR—8CF—8SP	8YN—8ZR—8ZW
9LQ—9ZJ—9FS	9ZJ—9LQ—9OE

Remarks: Very few stations coming through from First, Second, Third, Fourth and Fifth districts. Reception has been unusually poor during latter part of month.

A newcomer, 5EK, in the Fifth District has been heard a number of times and seems to be the most consistent of the stations in that district but not as loud as some of the others.

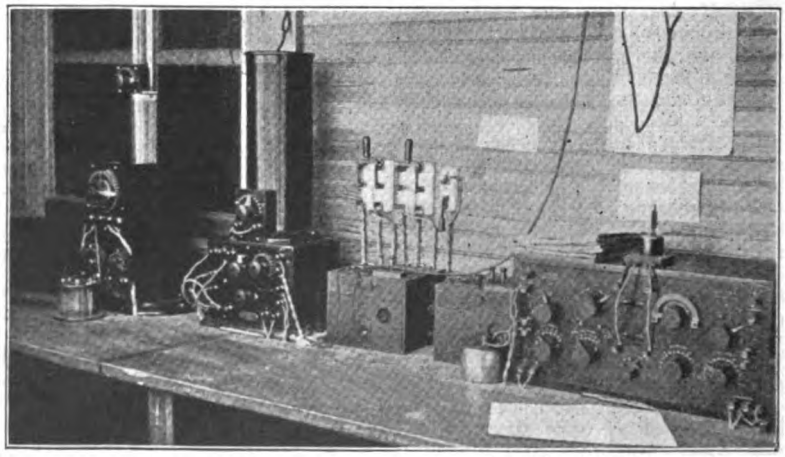
8ZR seems to be holding out in the Eighth District but most of the other good stations mentioned in past reports seem to have dropped off the earth. A new special 8YN comes in very loudly.

In the 9th District, 9LQ now gets credit for being the most consistent station. Since 9ZJ has gone down to 200 meters his signals although loud have a tendency to swing more. 9FS has been working consistently during the past month.

5XA, AUBURN, ALA.

(*Concluded from page 52*)

5XA is under the direction of Mr. V. C. McIlvaine, Laboratory Instructor, Box 12, Auburn, to whom correspondence should be addressed. Mr. McIlvaine advises us that 900 watts is the greatest power 5XA uses, at which input 4.5 amperes antenna current was attained on 270 meters with the coupling shown.



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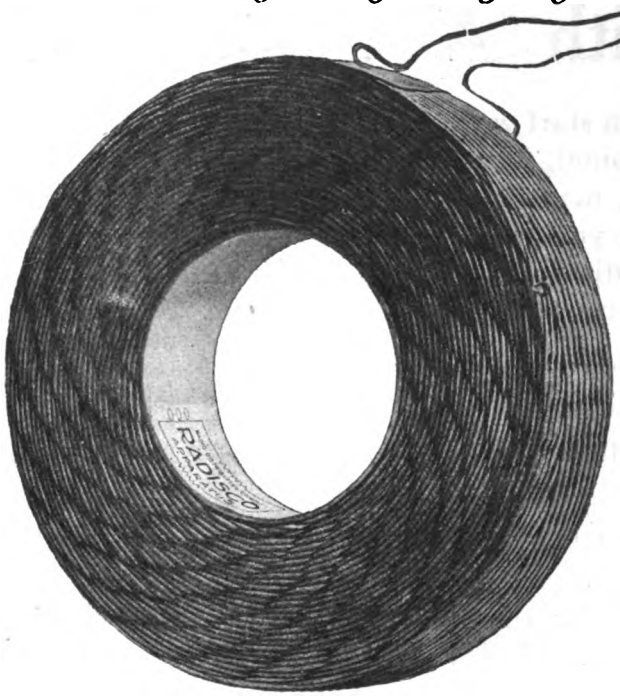
ALBANY, N. Y.
Shotton Radio Mfg. Co.
8 Market St.
ASHEVILLE, N. C.
Hi-Grade Wireless Instrument Co.
ATLANTIC CITY, N. J.
Paramount Radio Supply
Arkansas & Pacific Sts.
BOSTON, MASS.
Atlantic Radio Co.
88 Broad St.
BROOKLYN, N. Y.
Kelly & Phillips,
312 Flatbush Ave.
CHICAGO, ILL.
Chicago Radio Lab.
1316 Carmen Ave.
EUREKA, ILL.
Klaus Radio Co.
Branch, Peoria, Ill.
KANSAS CITY, MO.
McCreary Radio Supply
4th and Delaware Sts.
McKEESPORT, PA.
K. & L. Electric Co.
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NEW BRUNSWICK
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Rhode Island Elec. Equip. Co.
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IN PLACE of the *ABC* Combined VT Detector and One-Step Amplifier *UNIT*, you may add on these Units separately. But we strongly recommend the Combination Unit because it gives you (with the proper coils) sufficient range and sensitiveness to pick up any known type of sending station, code or phone, on any known wave length.

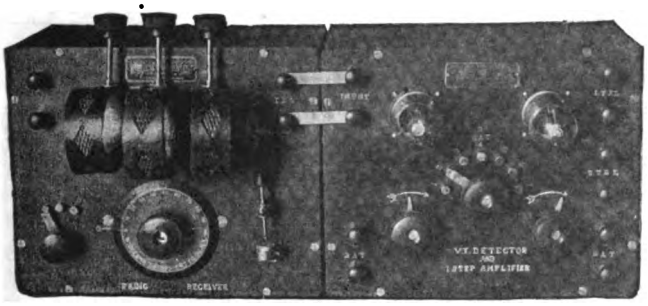
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The ABC Receiving UNIT

THE FIRST cabinet, the receiver itself, comes to you equipped with three *ABC* coils, an *ABC* 41 plate variable condenser, a tested



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THE FIRST TWO UNITS OF THE *ABC* SERIES.

The combination shown here is the ABC Receiving UNIT and the ABC Combined VT Detector and One-Step Amplifier UNIT. This set is highly recommended for receiving all classes of signals on all known wave lengths. A One or Two-Step Amplifier or the ABC Clarion may be added at any time. Price of the Receiving Cabinet complete, $24.50. Price of the Combined VT Detector and One-Step, $37.50 (without tubes and batteries). This entire outfit, including aerial, phones, tubes and batteries may be secured for about $84.00, a price never previously approached for guaranteed, high quality radio apparatus.

crystal detector, a switch for varying the wave length range, etc. The panel is a special impregnated fibre, highly polished, and carefully fitted to the handsome Kodak-finish cabinet. The price is $24.50.

FOR THOSE who want it, there is also provided the *ABC* Completion Package to go with this Unit. The Completion Package contains phones, aerial, insulators, ground clamp; in fact all the equipment needed to set a complete working station in two hours. This package is an unusually good buy at $7.50.

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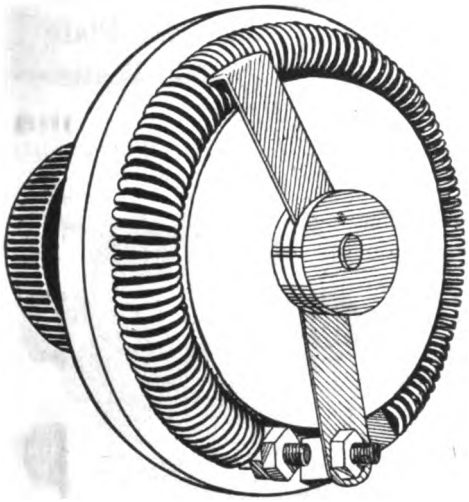
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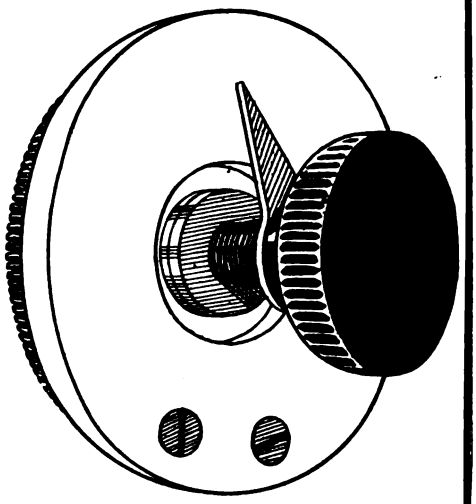
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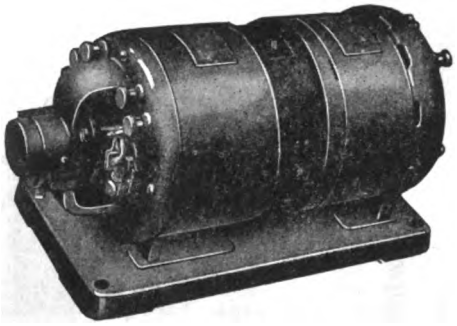
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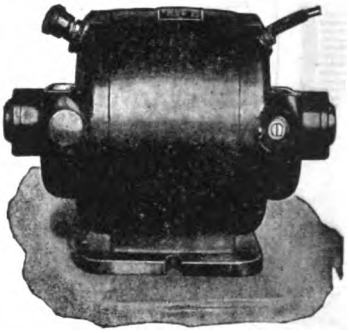
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ESCO

GENERATORS — MOTOR-GENERATORS — DYNAMOTORS

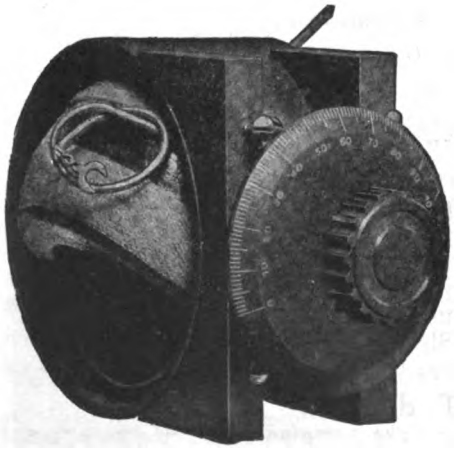


4 to 32 Volts for Filament.
350 to 2000 Volts for Plate
Capacity 20 to 2000 Watts
LIBERAL RATINGS
Write for Bulletin #231 Which Lists 200 Combinations.

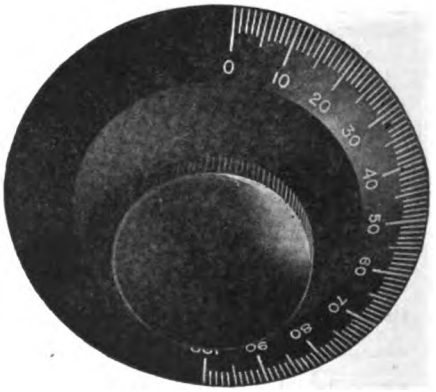


Motors and Generators Developed and Built for Special Purposes.
Pioneers in the Manufacture of High Voltage Direct Current Radio Generators.

ELECTRIC SPECIALTY CO.
215 SOUTH STREET
STAMFORD, CONN., U. S. A.



THE VARIOMETER
The now famous Z. R. V. Variometer has met with a tremendous sale, thousands being in use, by those who know the quality of Clapp-Eastham products.
Complete with knob and dial.....$6.50
Without knob and dial..... 5.75
Variocoupler to match with knob and dial 7.50



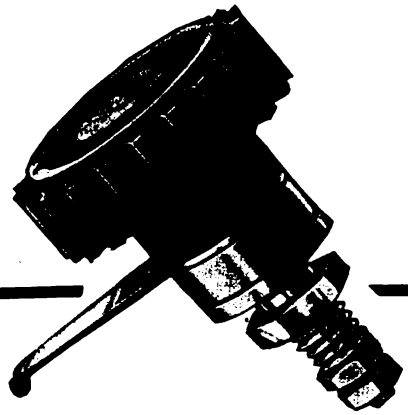
THE DIAL
This 3" knob and dial is our own product heavy brass dial black oxidized finish, composition knob 1⅜" diameter. Supplied for ¼" shaft only. This dial cannot chip or warp and will run true. Its beauty is in keeping with the best products of the instrument maker.
Price dial and knob #F800H complete..$0.75

Complete catalogs sent for 6c stamps
Patronize your local dealer: If he won't supply our material your order will receive immediate Factory attention.

CLAPP-EASTHAM CO., 114 Main St., Cambridge, Mass.
Headquarters for Radiotron Tubes. All types in stock.

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CORWIN'S Improved SWITCH LEVER



PRICE:— 90 cents, Postage, 5 cents.

A switch lever may be just a small item, but it pays to get a smooth running, well made switch like the one pictured above. This new Corwin switch is a handsome accessory that will add to the appearance as well as the efficiency of your set. The knurled knob is a special composition,—identical with the knobs used on the standard #67 Corwin Dial. The brass shaft is moulded right into the knob, so that it can never come loose. Blade, bushings, etc., are nickel-plated brass. Contact radius, 1¾". Send your order today. Satisfaction guaranteed.

NEW RADISCO VARIO-COUPLER

This is the coupler that caused such a sensation when it was announced two months ago. Sales have been tremendous, but we, never-the-less, have a generous supply on hand, ready for immediate shipment. "Accurate to the .002 part of an inch!" Moulded base, Formica tube, all metal parts brass. Price $7.50 postpaid.

CORWIN'S 1921 CATALOGUE—10c.

If you haven't already sent for your copy, don't lose another day. You will certainly want these 32 pages, listing all Corwin and Radisco instruments. You will find in this catalogue a good instrument for every part of your station at a price that won't "take the joy out of life". One dime and your name brings the catalogue by return mail.

A few specials from our catalogue,---ready to ship at once

New Pacent Plug.....$2.00
Postpaid.

FIRCO VOCALOUD
The ideal loud speaker. Requires no batteries, no adjustments, no extra equipment whatever.
Station type, ...$25.00
(in mahogany cabinet)
Laboratory type 23.00
(on metal base)

UNIVERSAL-COIL MOUNTING PLUGS
Anyone can easily make smooth-running mountings with these plugs. No bending, no filing, they are made to fit exactly, in the first place. Suitable for Radisco and all hand wound coils. A few minutes work with these plugs will save you dollars that can be put into better apparatus. Price 80 cents, postpaid.

GRID CONDENSERS
Radisco, postage 3c 35c

"B" BATTERIES
Radisco No. 1 (2 lbs.).....$1.50
Radisco No. 5 (5 lbs.) 2.65
Eveready Storage Battery prices on application

ROTARY SWITCHES
Clapp-Eastham No. 19.....$1.00
Clapp-Eastham No. 19A..... .35
Our Own No. 1..... .40
Our Own No 2..... .55
Postage 05

CORWIN DIALS
No 66, 3".....$0.75
No. 67, 3" with knob..... 1.30
No. 68, 3⅞"..... 1.00
No. 69, 3⅞" with knob..... 1.70
Postpaid

RECEIVERS
Murdock No. 55, 2000 ohm.....$4.50
Murdock No. 55, 3000 ohm..... 5.50
Brandes Superior 7.00
Baldwin C 16.50
Baldwin E, improved 20.00
Brownlie new 12.00
Shipping weight, 2 pounds.

VARIOMETERS
Radisco No. 1$7.00
Radisco No. 1D 8.50

All orders for apparatus not listed as postpaid must be accompanied by postage charges.

A. H. CORWIN & CO.
Dept. D4.4 W. Park St., Newark, N.J.

Remember Corwin's reputation for shipping mail orders promptly and in perfect condition.

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FORMICA

Sheets, Rods, Tubes

Made From Anhydrous Redmanol Resins

Insist on getting the best insulating material in your equipment and apparatus.

FORMICA is approved by the Bureau of Engineering, U. S. Navy, and is used by the leading manufacturers of radio apparatus.

Highest Insulation Resistance
Lowest Power Losses
Splendid Appearance
Excellent Machining Qualities

The following dealers can supply you with FORMICA sheets, tubes and rods.

Manhattan Electrical Supply Co.,
17 Park Place, New York, N. Y.

Clapp-Eastham Company,
139 Main St., Cambridge, Massachusetts.

The Radio Electric Company
3807 Fifth Ave., Pittsburgh, Pa.

Pennsylvania Wireless Mfg. Co.,
507 Florence Ave., New Castle, Pa.

Radiolectric Company,
919 Huron Road, Cleveland, Ohio.

The Wireless Manufacturing Co.,
Canton, Ohio

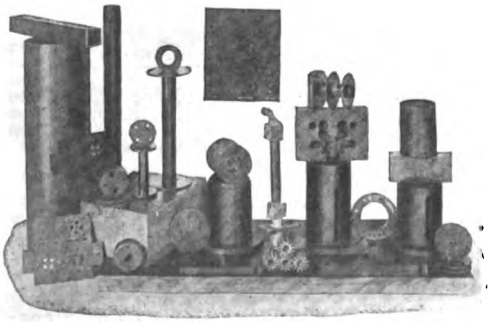
The Precision Equipment Co.,
2437 Gilbert Ave., Cincinnati, Ohio

Detroit Electric Company
434 Shelby Street, Detroit, Michigan

The Wireless Shop,
511 West Washington St.,
Los Angeles, California

Leo J. Meyberg Company,
428 Market St., San Francisco, Cal.

The Formica Insulation Co.
CINCINNATI, OHIO

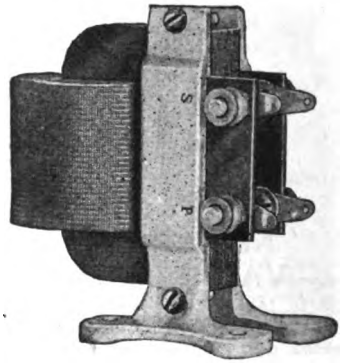


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AUDIO **FREQUENCY**

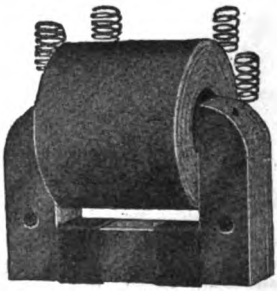
Amplifying Transformers

HIGHEST QUALITY
MOST EFFICIENT



$5.00

NOTE THE NEW (ONE PIECE) PUNCHED LAMINATIONS



UNMOUNTED

$4.00

SEMI-MOUNTED$4.50

—DEALERS WANTED—

Shipments Made From Stock Prepaid.

Note Change of Address

All American Elecl. Mfrs.

1516 NORTH LOREL AVE.,
CHICAGO, ILL.

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Announcing the

VŌCALOUD



* * * *

Laboratory Type

(Mounted without cabinet on metal base.)

Complete with 6″ cord, $23.00
Sound chamber alone, $12.00
Sound chamber, with base, $15
Vocaloud reproducer with 6″ cord, $9.00

Station Type

(Complete as shown in large photo)

$25.00

* * * * *

At Last- -

The Ideal Loud-Speaker for $25.

Hook a Firco Vocaloud right on to your receiving apparatus, and get your signals QSA—*all over your house!* No batteries, no adjustments, no extra equipment needed whatever! Just hook your Vocaloud in and listen!

Vocaloud reproduces wireless *telephone* perfectly, as well as code. It's reproducing elements are the same as a high-priced phonograph.

The reproducer itself employs the famous Baldwin *amplifying* mechanism. The sound chamber is designed and shaped like a *human ear*,—the most perfect sound amplifier known. These *exclusive* features are not duplicated in any other loud speaker at any price. Yet the price of a complete "station type" Vocaloud, (shown above) in an exquisite solid mahogany cabinet is only $25.00.

Examine a Vocaloud at your radio dealer's. If he should lack a supply, write for leaflet direct to

John Firth & Company, Inc., 18 Broadway, N. Y.

FIRCO RADIO

FIRCO Audion Detectors and Amplifiers
Radio Frequency Amplifiers
High Voltage Units
(with any primary voltage)
Baldwin Phones
Firco Vocaloud
Saco-Clad Transformer
Firco Accessories
Kolster Decremeter
United States Bureau of Standards Wavemeter
Eldredge Meters
(individually calibrated)
Brownlie Phones
(adjustable)

FIRCO RADIO EQUIPMENT

"Pioneers–since 1901"

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DO YOU KNOW?



DX-52 PRICE $25.00

That the current put into your oscillation transformer often exceeds the 2000 ampere mark? That if your O. T. is not wound with sufficiently large ribbon this current will be lost due to the resistance of the small ribbon?
Our DX-52 oscillation transformer is built to take care of this enormous current, being wound with 2¾" phosphor bronze ribbon, 4 turns on the primary and 8 turns on the secondary.

Aside from that it has bakelite insulation thruout thus insuring you against possible leakage due to poor insulation.
Another feature is that the coupling is adjustable while transmitting or testing allowing you to keep an eye on the radiation meter.
4 large 1½" wide clips are furnished free with this instrument DX-52 Price $25
This is the O. T. used by 8ZR in their trans-continental transmission to 6EJ, 6AK and 7ZJ.
Don't forget our DX-51 Spark Gap and C.W. power motor advertized in the March issue of Q S T. Price $30.00.

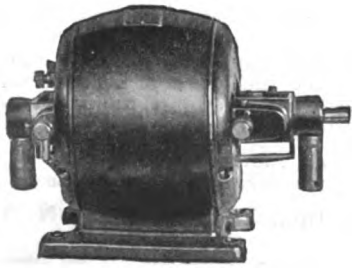
Write for our latest bulletin.

THE AMERICAN RADIO SALES & SERVICE CO.
GREAT AMERICAN BUILDING **MANSFIELD, OHIO**
Testing Station 8ZR

A 6 Volt Battery Will Operate A C.W. Transmitter

when used with a

RAY-DI-CO "DYNAMOTOR".



Ray-Di-Co "DYNAMOTOR" operates on 6 volts delivering 400 volts for space current.

"DYNAMOTOR" entirely enclosed—foolproof—portable—can be placed on automobile, motor boat or used for portable work or in station.

Capacity 15 watts — Net weight 18 lbs.

Price $52.35 F. O .B. Chicago.

Usual Ray-Di-Co standard of construction prevails.

RAY-DI-CO

(Ray-Dee-Ko)

2653D N. Clark St., Radio 9AG **Chicago, Ill.**

H. H. BUCKWALTER, 713 LINCOLN ST., DENVER, COLO.
Representative
Colorado, Wyoming, Utah, Nebraska, Western Kansas, Northern New Mexico, Deadwood and Lead, S. Dak.

"Meet us at First National Radio Convention Chicago Aug. 30-Sept. 3."

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THE LATEST "MURDOCK" VARIOMETER

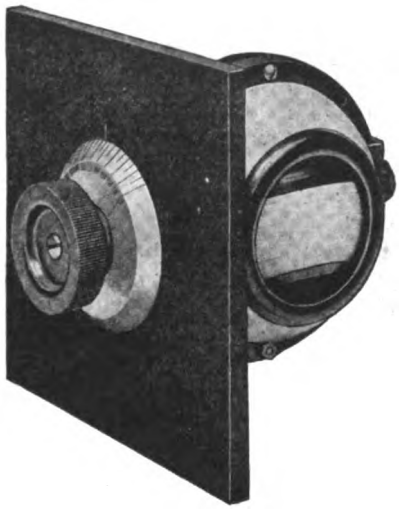
NO.

345

"MURDOCK"

VARIOMETER

$7.50



THE PRICE IS UNUSUALLY LOW

THE QUALITY IS REMARKABLY HIGH

WINDING FORMS ARE "MURDOCK" MOULDED

OTHER "MURDOCK" RADIO INSTRUMENTS

REAL RADIO RECEIVERS

No. 55 Double head receivers, complete with head band and cord:—

2000 ohm $4.50
3000 ohm 5.50

VARIABLE CONDENSERS

No. 366, 43 Plates, .001 MFD..... $4.75
No. 367, 43 Plates, .001 MFD..... 4.50

VARIABLE CONDENSERS

Panel Type

No. 3661, 43 Plate, .001 MFD with knob and extension handle $4.25
No. 3662, 43 Plate, .001 MFD with knob, dial and extension handle 5.00
No. 3681, 23 Plate, .0005 MFD with knob and extension handle 3.50
No. 3682, 23 Plate, .005 MFD with knob, dial and extension handle 4.25

BUY THEM FROM YOUR DEALER

Bulletin No. 20 Sent Anywhere on Request

WM. J. MURDOCK CO.

65 CARTER ST., CHELSEA, 50, MASS.

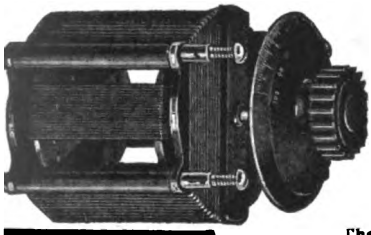
509 Mission St., San Francisco, Cal.

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The ESCO Regenerative Receiver—Improved



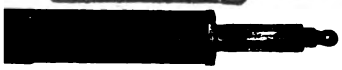
The original ESCO REGENERATIVE RECEIVER as described in previous issues of this magazine has been improved upon. The new set as illustrated above is contained in a smaller cabinet than originally so that now the set is easily portable. All of its former excellent operating features are but enhanced in the new outfit. The wave length range is 150 to 600 meters so that all amateurs and the majority of the commercial stations may be heard. Our new circular describes the set in full. Write for it. Price F.O.B. Columbus, Ohio or Philadelphia, Pa. is $50.00. Shipping weight 11 lbs.



ESCO variometers and vario-couplers as shown alongside are sold separately for the convenience of those amateurs who prefer to build their own equipment. The instruments are absolutely guaranteed to be satisfactory. Prices are as follows:

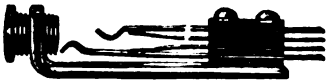
ESCO variometer with dial..$9.50 ESCO vario-coupler with dial..10.00
ESCO variometer without dial 8.50 ESCO vario-coupler without dial 9.00

PLUGS AND JACKS



The cut illustrates a plug and jack which have been on the market for only a short time but in that time have acquired a wonderful reputation. With their use many practical connections can be effected. Phone and amplifier connections are quickly made in multi-stage circuit. The upper and lower contacts complete a single circuit thru the phones when the removal of the plug automatically connects the amplifying transformer. Jack and plug are nickel-plated and very attractive in appearance.

Plug only, $0.75; Jack only, $0.35; Plug and Jack complete, $1.50.
Shipping weight 4 ounces.



Send 15c for our complete literature of Radio supplies. This amount will be refunded on your first purchase of $1.50 or over. High printing costs make free distribution impossible.

The Electrical Specialty Co.

Dept. L., 48-50 So. Front St., Columbus, Ohio.
Dept. L., 20 N. 9th St., Philadelphia, Pa.



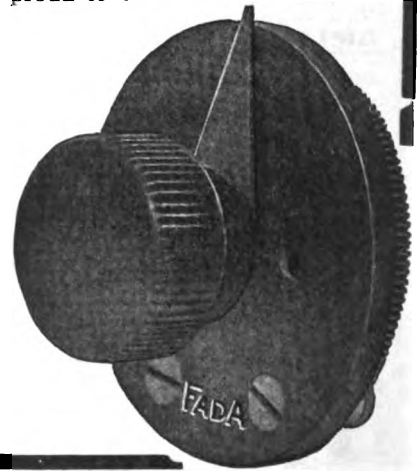
—YOUR INTERESTS

are just as valuable to me as are my own. That's one reason why the price of the FADA crystal detector (complete with Super-sensitive Galena Crystal) has been reduced from $3.00. The other reason is because the demand is so large that for the first time automatic screw machines make the parts in very large quantities.

FADA detectors are used by thousands of amateurs to-day. Many receive radiophone concerts, etc. with this detector and their simple receivers. You'll be proud to own one.

CRYSTAL DETECTORS now $2.50 each.

FADA panel-mounting RHEOSTAT $1.25 each.



Another mighty good buy is the new FADA panel-mounting rheostat. The base is made of an asbestos-synthetic material, Thermoplax, which resists heat up to 600° F. The resistance is 6 ohms and it will carry 1½ amperes. All exposed metal parts polished nickel including screws for mounting. The best rheostat that you can obtain and it costs less than others. Ask your dealers for FADA products.

FRANK A. D. ANDREA

MANUFACTURER OF FADA RADIO APPARATUS

1882-B JEROME AVE., NEW YORK

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The New Westinghouse Radio Receiver

A single-circuit tuner; a supersensitive crystal detector; a fixed condenser; and a set of head telephones, all in one case.

Just the outfit to take on camping trips or automobile tours to keep in touch with your home town.

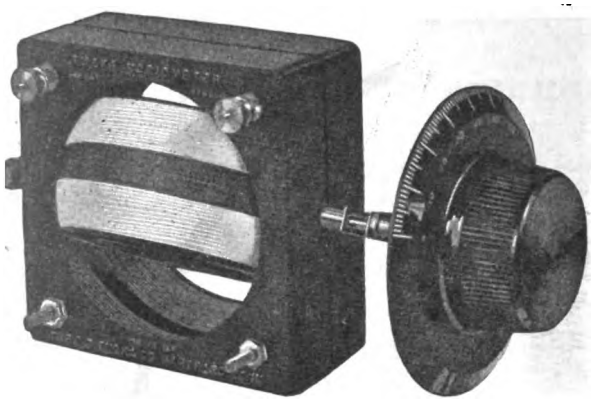
Weighs only 5 lbs. Wave-length range 190 to 500 meters. Send for Folder 4465.

PRICE 25.00

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
PITTSBURGH, PA.

Westinghouse

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TUSKA Moulded Variometer

MECHANICALLY AND ELECTRICALLY PEERLESS

TYPE 200. PRICE $7.25

SEE THEM AT YOUR DEALER'S

	INDUCTANCE		DISTRIBUTIVE CAPACITY	
OTHERS	**MINIMUM**	**MAXIMUM**	**MINIMUM**	**MAXIMUM**
No. 1.	**70.3 m.h.**	**940 m.h.**	**8.4 mmf.**	**44.1 mmf**
No. 2*	**75 "**	**440 "**	**22.8 "**	**60. "**
TUSKA°	**70.0 "**	**1560 "**	**14.0 "**	**55. "**

*Coil wound on OUTSIDE of moulded form. Notice the large distributive capacity for range.

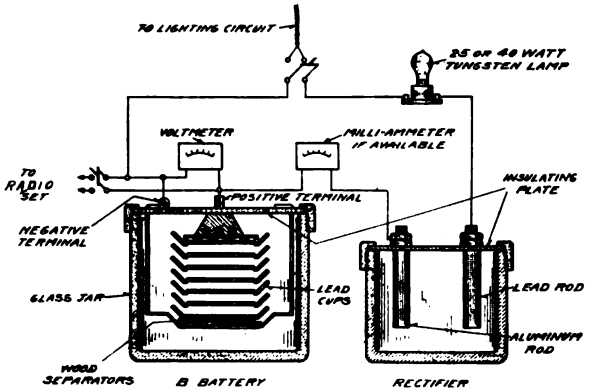
°Think how EXTREMELY low the DISTRIBUTIVE CAPACITY is in the TUSKA VARIOMETER compared with the EXCEPTIONALLY WIDE range.

Send 5c for C.W. and Variometer Booklets

THE C. D. TUSKA CO., HARTFORD, CONN.

The McTighe Storage "B" Battery

Patents Pending.



The McTighe Storage "B" Battery consists of 12 cells of the lead acid type giving 24 volts when fully charged. Its capacity, 10 milliamperes for eight hours is ample for using the potentiometer principle for obtaining any desired voltage.

A most satisfactory source of plate voltage for Radiophone and C.W. transmission is obtained by connecting a number of these batteries in series. A 300 volt set can be charged from two rectifiers in series and a transformer with a 400 volt secondary.

The battery and rectifier can be assembled easily and quickly by following the complete instructions which accompany each set of parts. Descriptive leaflet will be sent on request.

PRICE LIST

Set of parts for 12 cell battery wthout jar	**$2.50**
Lead aluminum rectifier parts without jar	**1.00**
Flint glass jar for battery, 4 x 4 inches	**1.00**
Flint glass jar for rectifier, 3 x 3 inches	**.75**

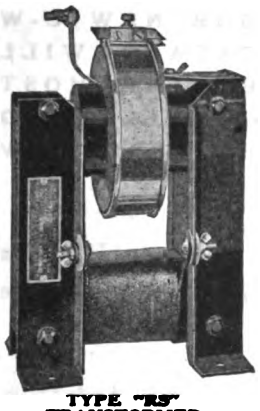
Postpaid.

McTIGHE BATTERY CO., Wilkinsburg, Pa.

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Important Reductions in Prices of

Thordarson Apparatus



TYPE "RS" TRANSFORMER

Type "RS" Transformers

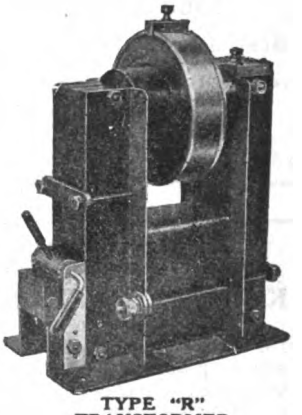
A non-resonant transformer with a lower secondary potential designed to give you the highest possible power factor.

1 KVA 15000 VOLTS	$30.00
½ KVA 10000 VOLTS	20.00
¼ KVA 8000 VOLTS	15.00

Type "R" Transformers

The famous resonant transformer affording the highest practical voltages.

1 KVA 25000 VOLTS	$40.00
¾ KVA 10000 VOLTS	28.00
½ KVA 10000 VOLTS	22.00



TYPE "R" TRANSFORMER

Other Thordarson Equipment

POWER CONDENSER (.0018-.009 MF)	$25.00
OSCILLATION TRANSFORMER	10.00
R8 ROTOR (8 TOOTH)	5.00
R16 ROTOR (16 TOOTH)	5.00
R12 ROTOR (12 TOOTH)	3.00

(Specify diameter of motor shaft when ordering rotors.)

A POSTAL BRINGS OUR CIRCULAR TO YOU.

Thordarson Electric Manufacturing Co.

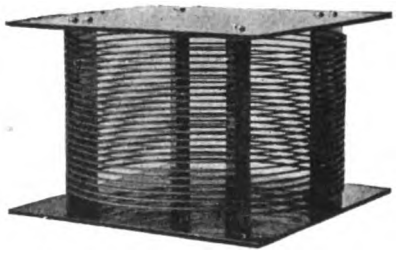
517 S. JEFFERSON ST., CHICAGO, ILL.

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C-W C-W C-W C-W C-W C-W C-W C-W

Prepare for the bad radio season by installing your CW outfit now. It will carry thru summer static and is ideal for relay work.

OUR C-W CATALOG WILL BE READY ABOUT MARCH 15th, SEND FOR YOUR COPY NOW.



OUR NEW C-W CATALOG WILL BE THE MOST COMPLETE AND BIGGEST — CW ONLY.

CW Inductance No. CW-100 shown above, mounted on Formica exclusively—25 turns edgewise copper strip 3/16 x .050" complete with connection clips, $10.00.

Send 15 cents for catalog, which amount may be deducted from first order of One Dollar or more.

"8ZV" WIRELESS MANUFACTURING CO. "8ZV"

CANTON, OHIO

"Chi-Rad" BULLETIN BOARD

Knocked Down Variometer Parts.

Read our ad in last month's QST and order your set today. Complete set of parts for two Variometers and Vario-Coupler for only $10.00. And remember all windings are in place—you have nothing to do but put on the end bearings and connect stator windings together. Guaranteed to be the best value on the market and to give perfect satisfaction when assembled or money refunded. Immediate Delivery—better send us your order right now.

The Big A.R.R.L. Convention.

This will be the biggest Radio affair of the year and every Radio-Man should be here during the entire five days, August 30, 31 and Sept. 1, 2 and 3, 1921. Make our store your headquarters, we will gladly show you the latest in apparatus, direct you about the city or put you in touch with other Chicago Amateurs without obligation of any kind. Material and space for letter writing provided free of charge.

Plan on this Convention, make your reservations to the proper authorities AND be sure to visit our booth at the Show—we'll have several surprises for you.

A Word About Stock.

We are Chicago and Middle West distributors for all the old reliable makes of Radio Apparatus. We aim to carry the largest and most complete stock in this section of the country and therefore can make Immediate Delivery of almost any desired piece of apparatus. If you are located in the Middle West send us your orders and have the instruments in two to four days. Better yet, if possible drop around and see our display of new apparatus which arrives weekly. All DeForest Interpanel Sets, Midget Radio Phones, etc., in stock. See the new Firth Loud Speaker at only $23.00.

Blue Print of 4 new C.W. Circuits for 15c. Bulletins of new apparatus free upon request.

CHICAGO RADIO APPARATUS CO., INC.

C. C. KLENTZ — L. L. LYNN.

Phone Harrison 1716.

508 S. DEARBORN ST., (ROOM 210) CHICAGO, ILL.

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MAIL ORDER "SERVICE"

PHILADELPHIA SCHOOL OF WIRELESS TELEGRAPHY PW

Reg. U.S. Trade Mark.

WE SHIP SAME DAY ORDER IS RECEIVED

Our large stock of all reliable makes of Radio apparatus enables us to make immediate Shipment of your orders.

ANTENNA SWITCHES
Murdock, 3 pounds $4.50
Clapp-Eastham, 10 pounds 12.50

AERIAL WIRE
7x22 tinned copper
100 feet 2 lbs $1.25
200 feet 4 lbs 2.40
500 feet 8 lbs 6.00

AMPLIFYING TRANSFORMERS
A.R. Co. (1 lb.) $6.00
Federal (1lb) 7.50

"B" BATTERIES
Radisco No. 1 (2 lbs.) $1.50
Radisco No. 5 (5 lbs.) 2.65
Eveready Storage Battery prices on application

CONDENSERS TRANSMITTING. (Dubilier)
No. D-100 250 W. 10,000 V. .007 MF $19.00
No. D-101 500 W. 14,000 V. .007 MF 30.00
No. D-102 1000 W. 21,000 V. .007 MF 45.00

CONDENSERS (Low voltage)
Western Electric 1MF 500 Volts $1.50
Western Electric 2MF 500 Volts 2.25
No. 21AA Western Elec. 1000 Volts A.C. 2.50
No. 577 Dubiliers .002 1000 V. 2.00

CONTACT POINTS
CP No. 1, Brass, dozen 25c
CP No. 4, Brass, dozen 35c
CP No. 5, Nickel Plated 45c
Postpaid

CORWIN DIALS
No. 66, 3" $0.75
No. 67, 3" with knob 1.30
No. 66, 3⅞" 1.00
No. 69, 3⅞" with knob 1.70
Postpaid

GRID CONDENSERS
Radisco, Postage 3c 35c

GROUND OUTFIT
Consists of SPDT 500 AMP Switch, 25 feet No. 4 wire, clamp and cleats prepaid $7.00

JACKS AND PLUGS
Federal Closed Circuit $0.85
Federal Open Circuit 70
Federal Double Circuit 1.00
Federal Plug 2.00
Postpaid

LOOSE COUPLERS
Clapp-Eastham Radion $14.00
Murdock 344 9.00
6 pounds.

OSCILLATION TRANSFORMERS
Radisco No. 5 $15.00
Via. Express collect only

ROTARY SWITCHES
Clapp-Eastham No. 19 $1.00
Clapp-Eastham No. 19A 35
Corwin No. 1 40
Corwin No. 2 55
Postage 05

REGENERATIVE RECEIVERS
No. CR-1 Grebe 175-680 Meters $90.00
No. CR-2 Grebe 175-680 Meters 45.00
No. CR-3Grebe "Relay Special" 175-680 Meters 65.00
No. CR-3A Grebe With tube control, 175-375 Meters 45.50
No. CR-5 Grebe's "Super-Special" 175-3,000 meters, tube control, self-contained. Complete receiving set. Just out 80.00

RECEIVERS
Murdock No. 55, 2000 ohm $4.50
Murdock No. 55, 2000 ohm 5.50
Brandes Superior 7.00
Baldwin C 16.50
Baldwin E., improved 20.00
Brownlie new 12.00
Shipping weight, 2 pounds

RADIO CRAFTS PRODUCTS
Detector $15.00
Two step Amplifier 50.00
Detector and one step 45.00
Detector and two step 70.00
Postage Paid
Regen. Receiver, 150-600 M. $90.00
Regen. Receiver, long wave type 145.00

TUSKA C.W. APPARATUS
181 Coil (2 lbs) $7.50
182 Coil (2 lbs) 10.00
183 Coil (3 lbs) 12.50
170 Flit. (8 lbs) 16.00

VACUUM TUBES
No. UV-200 Radiotron, detector $5.00
NO. UV-201 Radiotron, amplifier 6.50
UV 202 Radiotron, 5W. power 8.00
UV 203 Radiotron, 50W. power 30.00
UV 204 Radiotron 250W. power 110.00

VARIABLE CONDENSERS
A.R.CO. .001 $6.25
A.R.CO. .0005 5.00
With No. 67 Dial add 1.00
Murdock 366 4.75
Murdock 367 4.75
Murdock 368 3.75
Clapp-Eastham 500 7.50
Clapp-Eastham 500A 9.50
Clapp-Eastham 500B 11.50
Complete with dial
Shipping Weight One Pound

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Radisco No. 1 $7.00
Radisco No. 1D 8.50
3 pounds

VARIO-COUPLER
Radisco No. 3 $7.50
Radisco No. 3D 8.50
3 pounds

Philadelphia School of Wireless Telegraphy

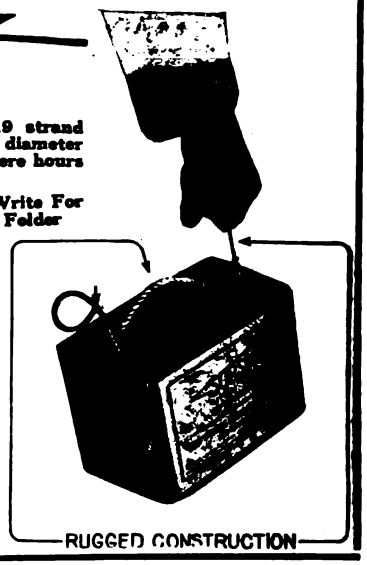
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SORSINC

22½ VOLT "B" BATTERY

4⅞"x5⅛"x8"



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Behind all this RUGGED CONSTRUCTION—What? The two 19 strand heavy service terminals connect to 15 cells, each 4" long and 1½" in diameter made up into a 12 pound unit that is "CHOCK FULL" of 6400 milliampere hours of energy.

PRICE $4.00 F.O.B. our N. Y. or Branch Offices — Add P.P. Charges — Shipping Weight 14 lbs. — Write For Folder

If your dealer cannot supply you, order direct from our nearest office

SHIP OWNERS RADIO SERVICE, INC.
80 WASHINGTON ST., NEW YORK CITY

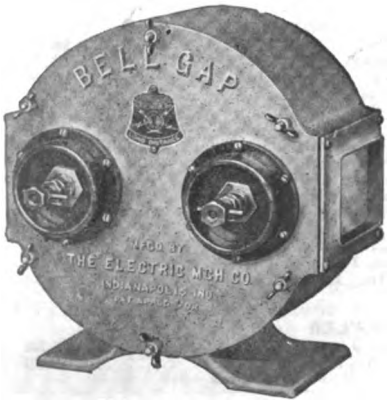
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Philadelphia, 201 Parkway B'dg.
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Savannah, 409 Mendel Bldg.
New Orleans, 710 Maison Blanche Annex.
Galveston, 813 Amer. Nat'l. Ins. Bldg.
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San Francisco, 24 California St.
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Of what value is an electrically correct gap if its bearings are continually wearing out? **The Bell Gap Is Built to a Machinist's Ideal as Well as That of the Radio Experimenter's.**

THE BELL GAP STANDS INSPECTION AND USE.

The Electric Machine Co., - - Indianapolis, Ind.

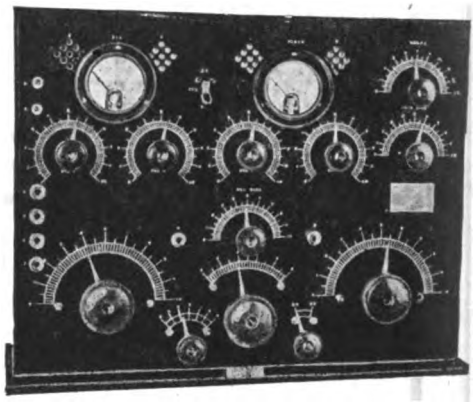
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has been reduced in price approximately 15% on each instrument

"OUR LATEST"



Z-NITH MULTICEIVER—MC-3

The most complete, efficient and flexible receiver ever designed. Described in detail in our Catalog F-21. Write for it.

The prices below represent our contribution toward the reduction of the "High Cost of Radio"

Instrument	Old Price	New Price
Z-Nith Regenerator	$65.00	**$55.00**
Amplifigon AGN-1	75.00	**64.00**
Amplifigon AGN-2	105.00	**89.25**
Amplifigon AGN-3	135.00	**115.00**
Hyrad Disc	12.00	**10.50**
Hyrad Non.-Syn. Gap	65.00	**49.00**
Hyrad Syn. Gap	125.00	**105.00**
Jeweler's Time Rec.	75.00	**69.50**
Multiceiver MC-3	265.00	**236.00**
Altaceiver CW-3	300.00	**254.00**
C. R. L. Regenerette	12.75	**12.75**
One-Step Amp. AM-1	33.50	**28.50**
Two-Step Amp. AM-2	65.00	**55.00**
Detector AD	20.00	**17.00**
Detector ADP	30.00	**25.00**

NEW CATALOG F-21 JUST OUT GIVES COMPLETE LIST OF PRICES

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TESTING STATION 9ZN—5525 SHERIDAN RD.

CHICAGO, ILLINOIS

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50,000 ft. Aerial Wire just received, 85ft. to the lb. pure copper #14 @ 45c. per lb.
Brass Rod, ¼" sq. @ 12c. per ft.
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Series—Parallel Panel Switches 83c. ea.
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Pancake Helix (Signal Type) $2.25
C.W. Inductance Coils for 250 watt $5.00.
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3600 Meter Loose Coupler $10.98
600 Meter Loose Coupler $5.90.

VT Receptacles $1.00 ea.
Radiotrons: Detector $4.90
Amplifier $6.40
Variable Grid Leaks,—necessary to use with Radiotrons, 69c.
Fixed Grid Cond. 33c.
Porcelain Rheostats for Panel $1.00; for table, 88c.
Nickel Binding Posts, good for 'Phones, large, 11c.; small 9c. ea.
Small size "B" Batteries, Ace type, $1.09.
Nov. date "B" Batteries 50c.
New Type Eveready "B" Battery, large, tapped each cell $2.75.

J J N Variometers.....$4.00
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10% DISCOUNT

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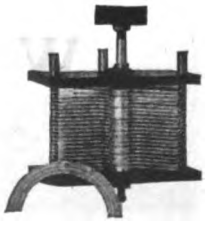
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TRESCO TEN $ TUNERS

When you think of tuners say TRESCO. One for every need and wave length.

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Knocked-Down Condensers

Assemble them and save money.

11 Plate.....$1.80
21 Plate..... 2.25
41 Plate..... 3.20 Add P. P.

If you want us to assemble them for you add $1.00, plus P.P., to above prices. Shipping weight 2 lbs.

10c brings a wonderful catalog of 16 pages. 100 testimonials and freak hook ups for our tuners.

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SIX Stages of audio frequency amplification!

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Radio Telephone and Telegraph Apparatus of Merit

JUNE AND JULY BARGAINS

Unmounted Amplifying Transformers	$3.45
Panel Mount Rheostats	1.35
Honeycomb or Duolateral Coils 20% Discount	
Moulded Gooseneck VT Sockets	1.75
D-101 Dustproof Galena Detectors	$2.15
Variable Grid Leaks—G-100	.55
Hard Rubber 180° Dials without Knob	.45
Hand Key—1K.W. Silver Contacts	2.95
Amrad Panel Rheostats	1.45

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K20—Enclosed Rotary Gaps	
20a—With Motor	$25.00
20b—Pulley Drive	20.00
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K2—16 pt. Sawtooth rotor	4.50
K3—10pt. Wide tooth rotor	4.50
K6—"Cootie" Double Action Key	4.50
K8—"Big Midget" Audion Cabinet	12.50
K7b—Honeycomb Tuner and two condensers	29.50
K4c—Audion Detector Cabinet	25.00

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DeForest Condensers—All Styles for immediate Shipment

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#3682 Murdock .001 Panel Mount	5.00
#K10 Chelsea Panel Mount with Dial	4.75

Perfection Knock Down Condensers
11 Plate $1.80, 21 Plate $2.25, 41 Plate $3.20

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Baldwin Type F	21.00
Baldwin Type C	16.50
Brandes Navy Type	14.00
Brownlie Adjustable	12.50
Liberty 2200 Ohms	12.50
Trans-Atlantic Brandes	12.00
Brandes Superior	8.00
Murdock #55—3000 Ohms	5.50
Murdock #55—2000 Ohms	4.50
Brown adjustable	17.00

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UV 200 Radiotron Detector	$5.00
UV 201 Radiotron Amplifier	6.50
UV 202 5 Watt Transmitter	8.00
UV 203 50 Watt Transmitter	30.00
C300 Audiotron Detector	5.00
ER Detector Tube	6.00
APVT Amplifier	7.00
APTT 5 Watt Transmitter	7.50

TRANSFORMERS

Acme 250 Watt semi mounted	$13.00
Acme 250 Watt fully mounted	16.00
Acme 500 Watt semi mounted	18.00
Acme 500 Watt fully mounted	22.00
Acme 1000 Watt semi mounted	28.00
Acme 1000 Watt fully mounted	33.00
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1500 Volt Acme Power Transformer	25.00
Thordarson Type RS-¼ KVA	15.00
200 Watt C.W. Power Transformer	20.00
Same semi mounted	16.00
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Same semi mounted	12.00
Unmounted Modulation Transformers	4.50
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Clapp-Eastham Variocouplers	7.50
Amrad Variometers	14.50
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Murdock Variometers	7.50
Murdock Variocouplers	8.50
Grebe Regenerative CR-3	55.00
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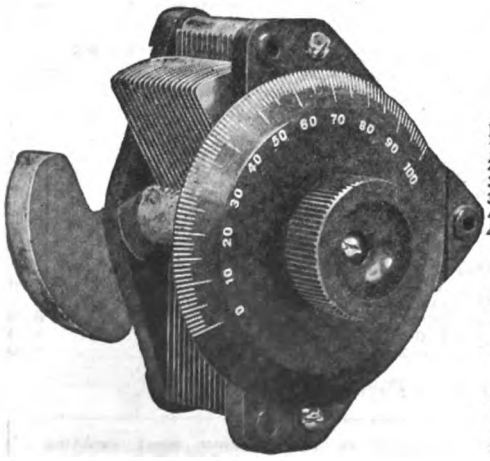
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The Marshall-Gerken Co.

127 Radio Bldg., Toledo, Ohio



Chelsea Variable Condensers

(*Die Cast Type*)

No.	Capacity	Type	Size	Weight	Price
1	.0011m.f.	Mounted	4⅝x4⅝x3¼	1¾ lbs.	$5.00
2	.0006m.f.	Mounted	4⅝x4⅝x2⅜	1¼ lbs.	4.50
3	.0011m.f.	With Dial	4¼x3x4	2 lbs.	4.75
3	.0011m.f.	Without Dial	4¼x3x4	2 lbs.	4.35
4	.0006m.f.	With Dial	4¼x3x3½	1½ lbs.	4.25
4	.0006m.f.	Without Dial	4¼x3x3½	1¼ lbs.	3.85

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates.

Unmounted types will fit any panel and are equipped with counter-weight.

Purchase from your dealer; if he does not carry it, send to us. Bulletin sent upon request.

Chelsea Radio Co., 15 Fifth St., Chelsea, Mass.

Manufacturers of Radio Apparatus and Mouldera of Bakelite.

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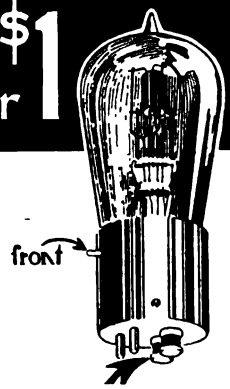
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Multiplies the Life of your Set

Destructive excessive amperage cannot reach the delicate filaments of any vacuum tube if protected by a

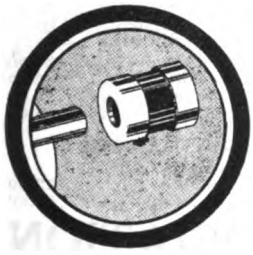
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SAFETY FUSE

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Carrying Capacity
1, 1¼, 1½, 2, 2½ and 3 amp. Size ¼ inch over all.

Slips directly on filament terminals of any standard socket without distorting springs or lowering efficiency. RADECO Safety Fuses positively protect your tubes indefinitely.



RADECO Safety Fuses are equally valuable in all C. W. work preventing injury to meters resulting from shorts. Send today cash, money order or certified check.

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35c. each

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FILAMENT RHEOSTAT



For Back or Front of Panel Mounting, 6 ohms, 1½ amps., 1⅛" dia.

$1.75 Post Paid

Immediate Shipment.

Standard VT Socket

Improved Contact Type

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Copper foil condenser 35c P. P.

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Include postage on 4 lbs.

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Acme Choke Coils, Double Coil	each	8.00
Acme Modulation Transformer, semi-mounted	each	5.00
Western Electric 1 mfd. Condenser; tested 1,000 volts	each	2.50
Conn. Telephone Transmitter	each	3.50
Radiation Ammeter; Jewell, 0-1 amp	each	6.00
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(We supply full directions with either detector or amplifier.)

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Acme core & coil assembled 4.50
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Mfg. by Radio Corp. of America.

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Chelsea No. 1 encased..... 5.00
Chelsea No. 2 encased..... 4.50
Chelsea No. 3BD with dial for panel..... 4.75
Chelsea No. 4BD with dial for panel..... 4.25
Murdock No. 366 .001 encased 4.75
Murdock No. 367 .0005 encased 4.50

TELEPHONES

Brandes Superior with Navy Band$8.00
Brandes Trans-Atlantic with Navy Band 12.00
Brandes Navy type with Navy Band 14.00
Western Electric type 1002A 15.00
Murdock No. 55, 2000 ohms 4.50
Murdock No. 55, 3000 ohms 5.50

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Clapp-Eastham ZRV Variometer, without dial.....$5.75
Clapp-Eastham ZRV Variometer with 3-inch dial..... 6.50
Clapp-Eastham ZRC Variocoupler, with knob & dial 7.50
Clapp-Eastham ZRC Variocoupler, with switch and points 9.00
J. J. Nightingale Variometer 4.50
J. J. Nightingale Variocoupler 5.00
Murdock G or P Variometer No. 345 7.50
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Clapp-Eastham ZRD detector panel$12.00
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Adams Morgan No. 70 control 6.00

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Acme 200 watt mounted....$20.00
Acme 50 watt mounted.... 15.00

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Acme A-3 semi mounted... $5.00

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150 M.A. Single coil..... $4.00
150 M.A. double coil..... 6.00
500 M.A. single coil..... 6.00
500 M.A. double coil..... 8.00

FILAMENT HEATING TRANSORMERS

75 watt mounted.....$12.00
150 watt mounted..... 16.00

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Quality Radio Equipment

New Grebe Portable Radio Station Type KT-1

Especially Adaptable and Efficient for Boy Scouts, Campers and Tourists.

Absolutely the newest and neatest combination Transmitting and Receiving Portable Outfit on the market. Complete with Grebe CR-5 Receiver, Transmitter, Vacuum Tubes, Batteries and Head Set in attractive and durable case.



$175.00 COMPLETE

Full line of Radiotron Vacuum Tubes and Accessories, and other Highest Grade Radio Supplies

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KENNEDY
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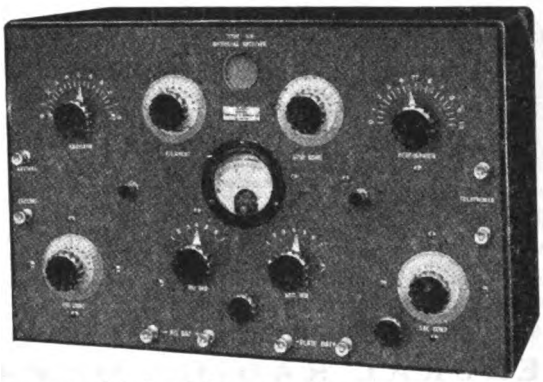
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THE NEW KENNEDY UNIVERSAL REGENERATIVE RECEIVER

TYPE 110

EFFECTIVE RANGE: 175 TO 25,000 METERS

DETECTS
REGENERATES
OSCILLATES
On all wave lengths in common use.



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Surpassing even our highest hopes when we undertook its development, this latest addition to the Kennedy line is of interest **to everyone who uses a radio receiving set.**

Our engineering staff spent many months in developing this unit and released it for production only when its performance surpassed every requirement we had set for it. By our long specialization in receiving equipment we have built up a reputation which is so precious that we can afford to put the Kennedy trade-mark on only the highest quality product.

We have spared no effort to make this the best receiver on the market. We honestly believe that it is.

These are some of its features:

Variable inductive coupling between primary and secondary.
Extremely sharp tuning because of very efficient inductance units.
Special Kennedy bank-wound moisture-proof inductors.
Generous overlap between inductance steps.
Large balanced primary and secondary variable condensers.
Micrometer adjustment of secondary condenser
Variable grid condenser with air dielectric, permitting most effective use of all types of available receiving tubes.
Adjustable feed-back circuit.
Fine adjustment of plate voltage by means of potentiometer connected between terminals of filament battery.
Weston ammeter for measuring filament current.
Bus-bar type insulated wiring.

Further details in Bulletin 101, mailed on request.

Ask your dealer for a demonstration. Compare the performance of this receiver with any other you have ever seen. The users of Kennedy Equipment are our best advertisers.

THE COLIN B. KENNEDY COMPANY

INCORPORATED

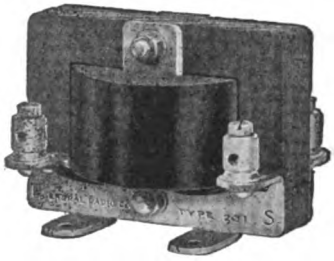
RIALTO BUILDING SAN FRANCISCO

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Rebuilding Your Set For Results



TYPE 156 SOCKET



TYPE 231 TRANSFORMER

Summer is the season in which to rebuild your set so that you may get the maximum of results during next winter. By rebuilding your set now, you will have more time in which to look over all of the available radio apparatus and to make a careful selection of those instruments most suited to your needs.

We have several instruments built particularly for the discriminating experimenter. In making your selection we invite you to consider these instruments. They are fully described in Bulletin 904Q, copy of which will be sent on request. Prominent among these instruments are the following:

TYPE 156 VACUUM TUBE SOCKET $1.75
Adapted for Receiving or transmitting tubes. Positive contact springs.

TYPE 214 RHEOSTAT $2.50
Made for receiving and transmitting tubes, and panel and portable mountings.

TYPE 231A AMPLIFYING TRANSFORMER $5
Designed to give the maximum amplification possible with a UV-201 tube.

TYPE231M MODULATION TRANSFORMER$5
Designed to give the maximum modulation possible without distortion using a UV-202 tube.

TYPE 127 HOT WIRE METERS $7.75
Flush or front of board mountings, and a variety of ranges. For filament and antenna currents.

Your dealer can obtain a complete supply of the standard parts, such as switches, binding posts, etc. used in the assembly of our instruments.

Standardize on General Radio Equipment Throughout.

GENERAL RADIO COMPANY

MASSACHUSETTS AVENUE AND WINDSOR STREET, CAMBRIDGE, 39, MASSACHUSETTS



A.R.R.L. MEN!

150 TO 25,000 METER REGENERATIVE RECEIVER IS HERE—THE "REGENIFIER"

The most remarkable, as well as welcome, piece of radio apparatus has been developed! No longer is it necessary to change wires and connections or plug in numerous coils, to get all the stations. The Regenifier is the latest innovaton of the popular regenerative circuit and applies this unapproachable circuit to a wavelength range covering every wavelength used, without the sacrifice of sensitivity or efficiency on any of the wavelengths covered. It is a marvel for C.W. reception.

In operation it is the last word in simplicity. Has only three controls each being variable over entire wavelength scale. there being no change-over from short to long waves. Its super positive control of oscillations and amplification together with its remarkable flexibility of operation has destined it to become the property of every exacting radioman. Encased in genuine Oak Cabinet 7x7x21 inches; panel Bakelite, four inch dials used, all metal parts highly nickeled.

No matter what model you buy, for any wavelengths you desire, the Regenifier will prove superior to any other receiver of similar nature. Each instrument guaranteed for two years. Order YOUR Regenifier at once.

THE REGENIFIER

THREE MODELS

150 to 475 meter Regenifier Only $48

150 to 4000 meter Regenifier Only $68

150 to 25,000 meter Regenifier Only $98

DEALERS WRITE.

Send For Circular

Glenhurst Research Laboratories, Omaha

SAVE A DOLLAR

THE BIG THREE "QST," "RADIO NEWS," "PACIFIC RADIO NEWS." ONE YEAR SUBSCRIPTION TO ALL THREE. **$5**

PACIFIC RADIO PUB. CO.

50 MAIN ST. SAN FRANCISCO

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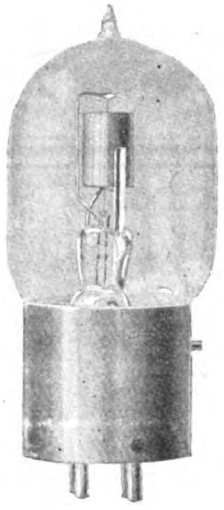
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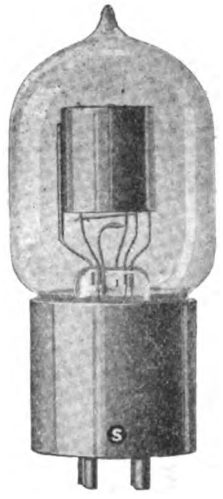
A-P Tubes have been imitated but never equalled. Those who use them **know.** Read this letter. Scarcely a day passes but what we receive, unsolicited, enthusiastic testimonials similar to the following:—

Gentlemen:—"We have recently received a shipment of E.R's and Amplifier oscillator tubes. It is our policy to test out all tubes received, under actual operating conditions. They were absolutely the finest bunch of tubes we ever received. It is indeed a pleasure to be able to sit down and with a clear conscience write a letter stating that we are at last receiving really good tubes for the amateur." THE PRECISION EQUIPMENT CO., 2347 Gilbert Ave., Cincinnati, Ohio, by H. F. Brickel, Vice President.

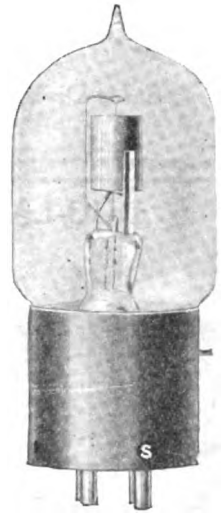
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THE A-P VT AMPLIFIER-OSCILLATOR —the amplifier used by the U. S. Navy. "Use the tube the Navy uses." Price $7.



THE A-P ELECTRON RELAY —the most sensitive detector of spark signals known to the radio art. Price $6.



THE A-P TRANSMITTER TUBE —an efficient undamped wave transmitter for use in radio-telephony. Price $7.50.

Order from your dealer or write direct. And for the best book on Radio ask your dealer for **"Elements of Radiotelegraphy,"** by Lieut. Ellery W. Stone, U. S. N., or order direct from—

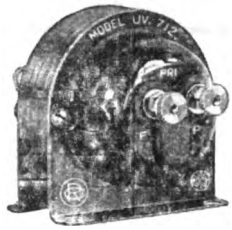
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THE NEW INTER-TUBE AMPLIFYING TRANSFORMER

Model
U. V. 712
Price $7.00



For use with
Radiotrons
U. V. 200
and U. V. 201

After many months of experimental work the General Electric Company has produced an inter-tube transformer of exceptional efficiency. This is Model U. V. 712 which we take pleasure in introducing.

Experimenters who are troubled with noisy amplifying circuits are urged to try this new transformer and thus convince themselves of its superiority.

Write for our new special bulletin showing the use of amplifying transformer U. V. 712.

Radio Corporation of America
WORLD WIDE WIRELESS

Sales Division, Commercial Department, Suite 1803
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	Turns	Wave Length	Price	
LOW NATURAL PERIOD	25	130-250	$0.50	LOW DISTRIBUTED CAPACITY
	35	180-450	.55	
	50	250-700	.60	
	75	400-900	.65	
	100	500-1400	.70	
	150	600-2000	.75	
	200	1000-2500	.80	
	250	1200-3500	.85	
	300	1500-4500	.90	
	400	2000-5000	1.00	
	500	3000-6000	1.20	
	600	4000-10000	1.40	
	750	5000-12000	1.60	
	1000	8000-15000	1.85	
	1250	10000-20000	2.40	
	1500	15000-25000	2.80	

EMPYREAN QUALITY THRU-OUT BACKED BY THE EMPYREAN GUARANTEE OF SATISFACTION OR YOUR MONEY BACK—USED IN CONNECTION WITH OUR VARIABLE CONDENSERS AND SPECIAL TURRET COIL MOUNTING, THEY COMPLETE A LONG DISTANCE RECEIVER UNEXCELLED BY EQUIPMENT COSTING THREE TIMES AS MUCH.

Bulletin for a 2-cent stamp.

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Satisfaction guaranteed
"RADIO'S BEST BUY"
60c POSTPAID 60c
AJAX ELECTRIC CO.
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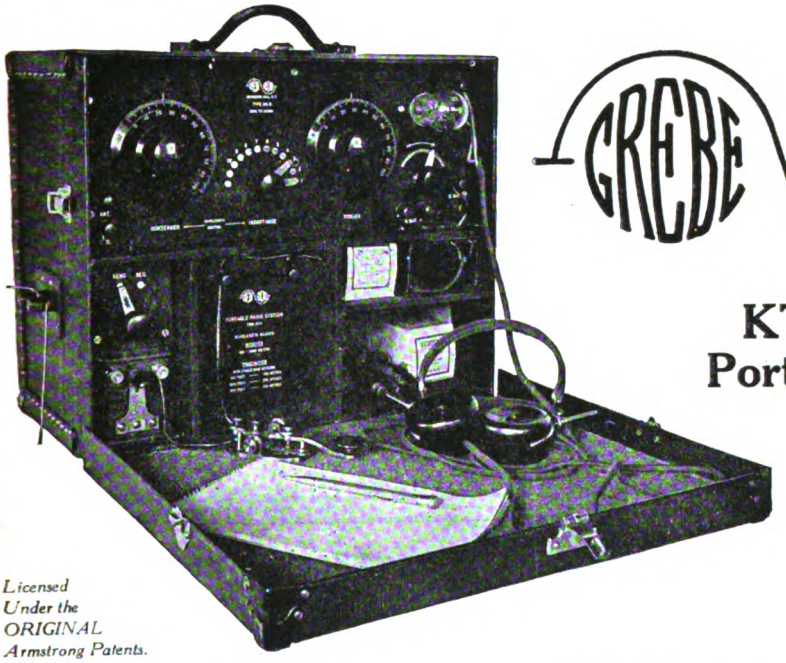
SIX Stages of audio frequency amplification!

See John Firth & Co.'s August advertisement.

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Summertime Radio

No need for you to shut up shop when Summer comes, that is, if you own a



GREBE RADIO

KT-1 Portable

Licensed Under the ORIGINAL Armstrong Patents.

At last here's the outfit that makes Summer radio work a pleasure.

Take it out into the country and send up a few hundred feet of antenna on a Grebe Radio Kite, and surprise yourself at its range.

Find out the range of your home station.

If you live near a body of water, procure a canoe or row boat and you have a ship station that sails under power of your kite.

Then, when Winter comes again, merely replace the CR-Regenerative Receiver in its cabinet and use it in your station for *real results*.

See it at your Dealer's, today!

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J. H. Bunnell & Co., New York City
F. D. Pitts Co., Inc., Boston, Mass.
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Flange diameter, 3¼ inches
Body diameter, 2⅛ inches
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Model 425 Thermo-Ammeter

to measure the radiation current and be certain that you are putting current into the aerial.

Model 425 is a small size instrument harmonizing with all other standard radio equipment. It possesses exceptional characteristics which make it the ideal instrument for radio service; its low power consumption allows the greatest possible energy to be put into the aerial; its 50% safe overload capacity is a protection against accidental burn-out; its size is conservative of space; it operates on either audio or radio frequencies.

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Offices in principal cities throughout the world.

Cunningham and Radiotron Tubes



DETECTORS - - - - $5.00

AMPLIFIERS - - - - $6.50

5 WATT POWER TUBES - - $8.00

We Stock a Complete Line of Acme, Clapp-Eastham, Murdock, DeForest, Moorhead, Remler, Grebe, Amrad, Baldwin, Burgess, and Apparatus of Many Other Makes.

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Call Letters 1IAP — **WESTERLY, R. I.**



SOMETHING NEW!

A Log-book for the Citizen Radio Station Operator, in which he can keep a complete record every day of stations heard and worked.
We can also supply an entirely new card system, one a plain postal card with your call letters printed on it, the other a double card, having a return acknowledgment postal for confirmation.

C. B. CLARK AND SON

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RED-HEAD Radio 'Phones

NOW **$8.00**

Complete Postpaid to Any Address

Price cut from $12.50 to to $8.00
At one Big Slash !

Buy Now--- Profit by our bigger sales and lower costs

IMPROVED 1921 MODEL

3000 Ohms

Latest and best we ever made



SPECIFICATIONS

3,000Ohms resistance (each receiver 1500 Ohms) wound with electrolytic copper wire of the highest grade; the best magnet steel available is used—and plenty of it; cast aluminum backs; genuine Bakelite unbreakable ear caps; furnished with braid-covered military type or genuine phosphor-bronze split head-band, extra fine 6 ft. cord with strain loops and posts; cord connections made on outside of receiver, easily adjusted without tampering with carefully adjusted interior; interior parts are highly nickeled and polished.
Remember the ear caps fit snug and are practically unbreakable.

OUR BROAD GUARANTEE

We rely upon the fairness of our customers. A refund or satisfactory adjustment will be made for any merchandise not found entirely satisfactory by you, its purchasers. You are to be the sole judge. Your decision will be ours.

Increase your receiving range with an Arlington.. To avoid the many imitations, look for the signature of J. S. Newman on each box.

HIGHER QUALITY AT A LOWER PRICE

Newman-Stern sets the pace back to normal! The self-same Red-Head which literally swept the country and sold everywhere at $12.50 are now yours for only $8.00. They were admittedly the world's best buy at $12.50; they have absolutely no competition at this new, low, bed rock price of $8.00.

The reasons we can make this cut are, briefly; Bigger sales and greater production, Lower manufacturing costs, A determination to bring prices back to normal, To put Red-Head quality within reach of every experimenter.

The new and improved 1921 Red-Heads are as rugged and sturdy as ever—but even more exquisitely sensitive. The same snug fit; the same high grade minutely accurate interior. The same handsome, well finished appearance—but wound to a higher resistance. They are now better than they have ever been before, during five years of leadership.

When we first made Red-Heads we challenged every user to test them out in competition with his favorite receiver; scores of letters from delighted users prove Red-Head superiority in tone and sensitiveness. You will say the same. Try them under our guarantee; we refund your money if they are not just as represented.

ARLINGTON TESTED CRYSTALS



NOW 25 CENTS
(Reduced from 35c.)

NAA (Arlington) tested minerals are the original tested crystals—absolutely the best that money can buy for radio detector and wave meter work. Exquisitely sensitive.

We scour the world for the best obtainable raw material, we secure scores of samples from every known source of supply and select only those of just the right crystalline structure for perfect radio work.
Each crystal is cut into right detector size, tested for sensitiveness and only those found perfect are good enough for us to sell you. Each "Arlington" is carefully wrapped in foil, packed in a convenient lithographed metal container and comes to you perfect.

WE DISTRIBUTE THE REPUTABLE RADIO PRODUCTS OF LEADING MANUFACTURERS

Being one of the very oldest firms in the country dealing in radio apparatus the best manufacturers have appointed us as their distributors. We list a few of the well-known companies we represent: Remler, Murdock, DeForest, General Radio, Amrad, Grebe, Acme, Federal, Radio Corporation, Magnavox, Burgess, Signal, Federal, Baldwin, Tuska, Corwin, Adams-Morgan.

IMMEDIATE DELIVERY

Prices Include Postage

UV-200 Radiotron	$5.00
UV-201 Radiotron	6.50
UV-202 Power Tube	8.00
P1 Corwin Dial, with Knob	1.30
P2 Corwin Dial, less knob	.75
981 Tuska Variometer	6.25
810 Remler Panel Rheostat	1.00
1421-W Federal Open Circuit Jack	.70
1423-W Federal Two Circuit Jack	1.00
92 Remler VT Socket	1.50
A2 Acme A. F. Amplifying Trans.	5.00
550 Murdock VT Socket	1.00
HM-100 DeForest Hand Microphone	6.00
R-500 DeForest VT Socket	1.25

Jewel Radio Meters in all needed scales.
The new DeForest C.W. Unit Panels.
All the Radio Corporation New C.W. Apparatus.
All Amrad Cabinets and Units.
The New Westinghouse Receiving Cabinets.

Our tremendous stocks, the largest in the middle west, comprise over 2500 separate items. Your requirements will receive our immediate attention.

SOLD BY REPUTABLE DEALERS EVERYWHERE

Any of the above articles sent postpaid on receipt of price.
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The Newman-Stern Co.

Send for catalog on Electrical supplies. Wireless Goods, Athletic Goods, Toys, &c.

Newman-Stern Bldg **Cleveland, Ohio**

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New Series of Bulletins

On Radio Apparatus is now ready. Bulletins describing more complete and advanced equipment will soon follow.

In the meantime, send five cents for the first Bulletin No. 10, which will indicate the beginning of the line which we will offer to discriminating amateurs, experimenters, colleges, etc.

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WIRELESS IMPROVEMENT COMPANY

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Dealers we have an attractive proposition for you.

Business is GOOD on GOOD "B" Batteries—Because GOOD "B" Batteries Make GOOD Business.

Stuart Batteries bring in the signals until the last bit of energy is gone—then you realize that Stuart Batteries give you longer life—more PEP and better service at a reasonable cost.
No. 5677.

Small price—Popular size—tremendous PEP.
Size 5" x 3" x 2¼". Weight 2¼ lbs. Price $2.25.

Send us the name of your dealer, and receive the latest Bulletin on Radio batteries, postpaid.

STUART PRODUCTS CORPORATION

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C.W.—450 VOLT D.C. GENERATOR—C.W.
$37.50

Get your C.W. set working, fellows. This generator will supply all the high voltage D.C. you need. It's rated at 450 Volts, 400 milliamperes, or 180 watts at 3500 R.P.M., but will carry 600 milliamperes safely without overheating. The voltage will go up, of course, if you use less than the rated 400 milliamperes. A resistance must be used in the field circuit at all loads.

This generator is equipped with Fafnir ball bearings—a sign of the highest quality and a point not to be overlooked.

½H.P. 110 VOLT, 60 CYCLE, 3500 R.P.M. MOTOR
$42.50

This motor is really underrated and can be used for all around work but is especially suited to be coupled directly to the generator described above. It also is equipped with ball bearings.

These machines are made exclusively for us by one of America's best motor manufacturers and are guaranteed to be just as represented. This offer is a bargain. Judge for yourself.

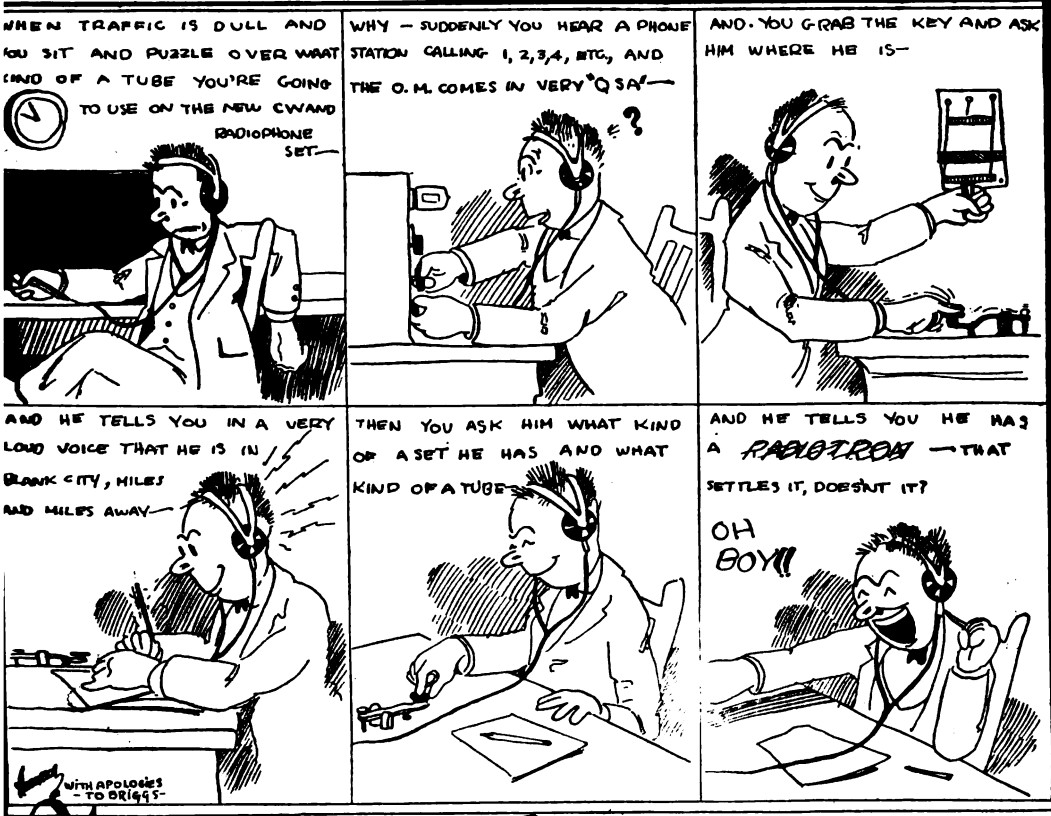
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A power tube for every need



A Popular Size
Radiotron U. V. 202
Rated at 5 watts
Price $8.00

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5 WATTS—Price $8.00
Filament requires 7.5 volts at 2.35 amperes. Plate requires 350 volts at .045 ampere.

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50 WATTS—Price $30.00
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250 WATTS—Price $110.00
Filament requires 11 volts at 14.75 amperes. Plate requires 2000 volts at .25 ampere.

Kenotron Rectifier U.V.216
20 WATTS—Price $7.50
New model for use with 5-Watt Radiotron.

Radio Corporation of America
WORLD WIDE WIRELESS

Sales Division, Commercial Department Suite 1803
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Kelly & Phillips' new 200 page catalogue lists all the apparatus available for every radio need. Besides hundreds of illustrations, prices, descriptions, etc., it contains codes, tables, press schedules, and 48 pages of useful information. Mailed anywhere postpaid for 25 cents in stamps or coin. It's a big quarter's worth, and anyway, your quarter is credited to your first $2.50 order. Send your name and 25 cents today for your copy.

A few specials below reprinted from our catalogue. Right in stock, ready to ship!

22½ Volt "B" Battery, small,	$1.25
22½ Volt "B" Battery, large,	2.40
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AUDION RECEIVER PARTS:

Bakelite Panel,	$1.50	
200 meter coil,	1.80	
Chelsea condenser,	4.75	
Binding posts,	.50	
Acme detector unit,	10.00	
Brandes Superior Phones, Complete	8.00	$26.55
Radiotron U.V. 200, detector,		$5.00
Radiotron U.V. 201, amplifier,		6.50
Radiotron U.V. 202, transmitter,		8.00
Baldwin Phones, Type "C", Navy standard		$16.50
Radisco new moulded Vario-Coupler,		7.50

Kelly & Phillips

Radisco Agency

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All Your Friends Want to Hear that Radiophone Music

—but so many phones cannot be placed in the same circuit.

THE RADIO MAGNAVOX

will solve your problem and allow everyone to listen in. With suitable amplifiers the signals and music can easily be heard by all. Remember that full field current need not be used except for the very weakest signals, or when extreme volume is necessary.

Price **$45**

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The Sign of Service!
All We Ask is a Chance to Prove It!

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Service Reaches All Over the World! Why Not Let It Reach You?

RECEIVING APPARATUS
AMPLIFYING TRANSFORMERS

No. UV-712 Radio Corporation, new type just out, very efficient	$7.00
No. 231-A General Radio, new type	5.00
No. 226-W Federal, mounted	7.00

AMPLIFIERS

No. RORK Grebe two step with automatic filament control	55.00
No. RORD Grebe Det. and two step with automatic filament control	75.00
No. Y-2 Acme in cabinet	13.00

AUDION CONTROL PANELS

No. RORH Grebe in cabinet, with tickler connections	17.00
No. Y-1 Acme in cabinet	10.00
No. P-1 Paragon, moulded type, small and compact	6.00

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No. 7625 Standard, 22.5 V. large	2.25
No. 7650 Standard, 22.5 V. variable	3.50
No. 763 Everready, 22.5 V. small	2.25
No. 766 Everready, 22.5 V. large	3.50
No. 766 Everready, new type 22.5 V. variable	3.00

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No. ROCD Grebe .0005 MF	1.20
No. ROCE Grebe .001 MF	1.60
No. ROCF Grebe .005 MF	3.80
No. ROCA Grebe .0002 MF and .5 meg. leak	1.20
No. ROCB Grebe .002 MF and 3 meg. leak	1.20

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No. T-1 Tuska, 4" dia. Bakelite, new type, just out	1.50

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No D-101 DeForest, dustproof	2.00
No. RPDA Grebe, dustproof	2.75
No. 8854 Jove	1.50

GRID LEAKS

No. MW-1 Radio Corporation ½, 1, 1.5, 2 3 and 5 megohms, complete each	1.25
Grid leaks only	.75
Bases only	.50

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No. CR-3A Grebe 175-375 meters with tube control, complete set	45.50
No. CR-5 Grebe "Super-special" 150-3000 meters, complete set, ideal for jewelers for time signals	80.00
No. CR-6 Grebe 175-680 meters, Det. and two step amp. self contained complete set	200.00
No. CR-7 Grebe 500-20,000 meters "Long Wave Special" complete set	210.00

(New England distributors of Grebe apparatus. Always in stock.)

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"Pittsco" No. 14 Hard drawn copper, per lb. (80 ft. per lb.)	.50
1000 ft.	5.00
"Pittsco" 7 strand No. 22 tinned copper, stranded (65 ft. per lb.) per ft.	.01
1000 ft.	8.50
"Pittsco" 7 strand No. 20 phos. bronze, per ft.	.02
500 ft.	8.50

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C.W. POWER TRANSFORMERS

Acme 50 Watt 350 Volts, mounted	$15.00
Acme 50 Watt 350 Volts, unmounted	12.00
Acme 200 Watt 350-550 Volts, mounted	20.00
Acme 200 Watt 350-550 Volts, unmounted	15.00
Acme 500 W 1000-1500 V. mounted	25.00
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Acme single coil 150 M. A. capacity	4.00
Acme single coil 500 M. A. capacity	6.00
Acme double coil 150 M. A. capacity	6.00
Acme double coil 500 M. A. capacity	8.00

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No. 3 Chelsea .0011 Mfd. unmounted	4.75
No. 4 Chelsea .0006 Mfd. unmounted	4.25
No. 182-G General Radio .001 Mfd. unmounted	9.75
No. 366-Int. Murdock .001 Mfd. unmtd.	4.25

FILAMENT HEATING TRANSFORMERS

Acme 75 Watt, latest type, mounted	12.00
Acme 75 Watt, latest type, unmounted	9.00
Acme 150 Watt, latest type, mounted	16.00
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No. 170 Tuska type	16.00

INDUCTANCES, C.W.

No. 181 Tuska Cap. feed-back circuit	7.50
No. 182 Tuska, split filament	10.00
No. 183 Tuska Grid tickler	12.50

METERS

No. 127 General Radio, Hot wire, flush, .5, 1, 2.5, 5, and 10 Amps	7.75
Model 301 Weston, D. C. meters, flush, 0-100, 300, 500 and 800 milli-amps	8.50
0-1, 2, 3, 5 and 10 Amperes	8.50

MICROPHONE TRANSMITTERS

No. 323-W Western Electric	3.95
No. 323-W Western Electric, with bracket	4.50
No. 5176-A Connecticut, with Adj. arm	4.00
No. HM-100 DeForest, hand type	6.00

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Acme A-3 semi-mounted	5.00
Acme A-3 fully mounted	7.00
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The "Miraco" Vacuum Tube Detector

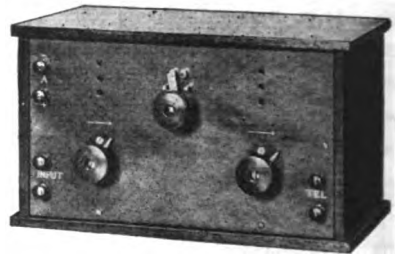
The new "MIRACO" Detector contains features not found in others at double the price. There is ample space in the hinged covered cabinet for "B" batteries and additional binding posts on the back of panel enable the operator to connect them inside.

$7.85 Postpaid.

Complete ready to use, only

The "Miraco" Two Stage Amplifier

The "MIRACO" Two Stage Amplifier is distinguished for its unusual amplification and quietness in operation. May be operated from same "A" and "B" battery used for your detector. But cabinet includes a shelf for additional "B" batteries for the amplifier. A switch automatically changes the circuit from one to two stages of amplification.



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These "MIRACO" units are ideal for radio-telephone and telegraph work during the static season.

THE MIDWEST RADIO CO., Dept. E., 3423Dury Ave., Cincinnati, O.

SIMPLEX VARIOCOUPLER



Price as illustrated $6.00
Simplex Variometer $6.00

This instrument is designed along the same lines as the Simplex Variometer. The Primary Tube is of black polished formica, 4 inches in diameter, the secondary ball and base is of thoroughly seasoned natural finished wood. The windings are of the same size wire as furnished on the Variometer No. 19 cotton covered, and the Primary is tapped in two groups, one of single turns and the other of seven turns each, making it possible to secure any combination up to 49 turns.

These taps are all tinned ready for soldering to leads. Bearings are similar in construction to those furnished on the Variometer having the same contact springs. Furnished with ¼ Shaft long enough for panel mounting.

The Simplex Variocoupler when used with two Simplex Variometers, makes a combination above the average Regenerative Set.

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For the last few months we have been telling you of the "RESULTS" accomplished by the EASTERN RADIO INSTITUTE. This month we want to tell you of its "ADVANTAGES."

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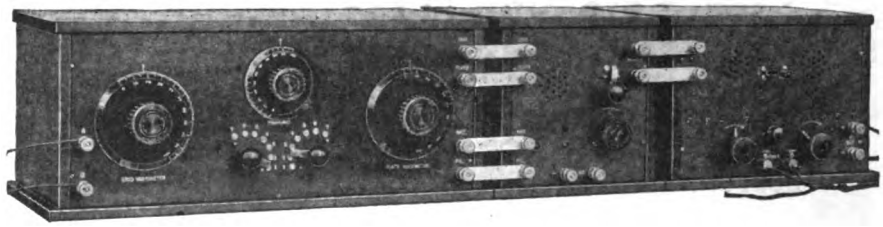
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Remember—Our Organization with over EIGHT years of Continued RESULTS and SUCCESS is behind every student who enrolls. If you want to become a Commercial Radio Operator let us train you. Just join our SUMMER CLASSES!

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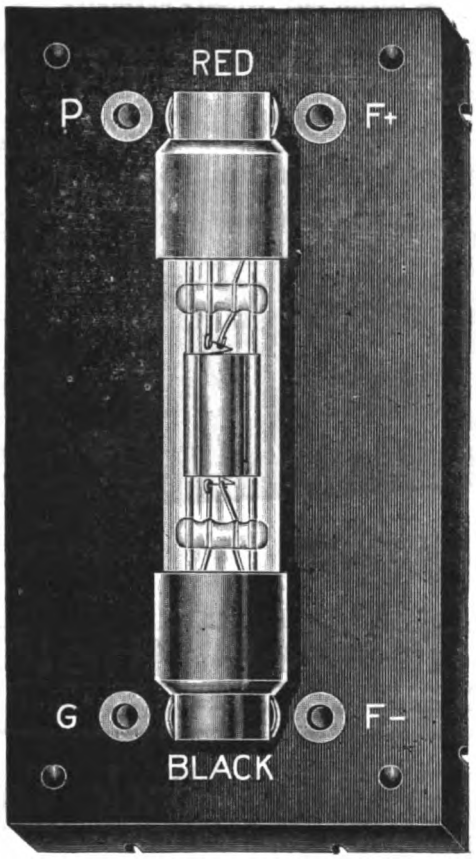
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No Radio outfit up to date without the RAC-3 Audion.
No need for buying "soft" or "hard" tubes.
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Receptacle block is designed to permit built-up panel construction for amplifier panel. Circuit connections may be made from front, back or sides.
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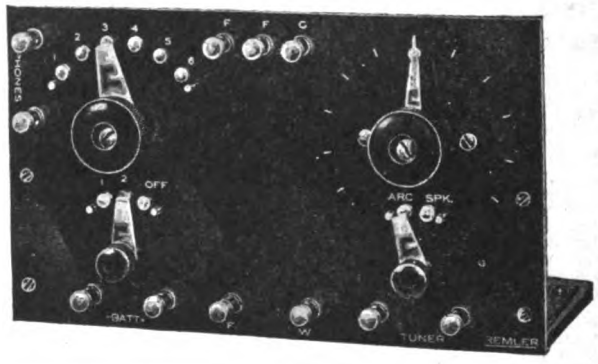
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Same as above, but without VT Mounting 9.00

CESCO Variometers, each.....$5.25
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This Audion Control Panel is the greatest panel value ever offered. It will not discolor like hard rubber, nor is it brittle or easily damaged. The panel is cut from solid sheet —not moulded. Surface highly polished. Lettering and scales machine cut — not stamped — and whitened. Metal parts heavily nickeled. Filament rheostat back mounted. Wound for 5 ohms, it permits close adjustment of filament temperature.

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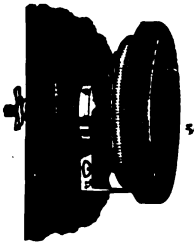
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We Originate **Benwood Synchronous Gaps** Others Imitate

The finest rotary quenched synchronous spark gap that has ever been produced.

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SILENT IN OPERATION—VISIBLE SPARK—NEW TYPE GLASS INSULATORS—REMOVABLE AND RENEWABLE POINT ROTOR (exclusive feature pat. applied for)—3600 RPM. SYNCHRONOUS MOTOR (exclusive feature)—OIL-LESS BEARING (graphite.)

By driving this gap 3600 RPM. enables the use of a

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The Benwood Company, Inc.

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These instruments are wound with extra heavy wire to reduce the resistance, and have special long bearings with a spiral spring inserted to insure a perfect and self cleaning contact at all times. The taps on the Vario-Coupler are arranged in two groups.

PRICES PREPAID

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Detector Panel$9.50
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Stop in and see us, or drop us a line.

SPAFFORD'S

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FIRST NATIONAL A.R.R.L. CONVENTION & RADIO SHOW

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IT sure is going to be some affair and you don't want to miss meeting those fellows that you have heard so much about.

And the Radio Show with all the manufacturers and dealers with their latest apparatus will be on hand. The immense Broadway Armory will be just filled with apparatus and fellows you want to see.

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Come along, fellows, and spend five of the happiest days of your life with a real live crowd at Chicago during convention week.

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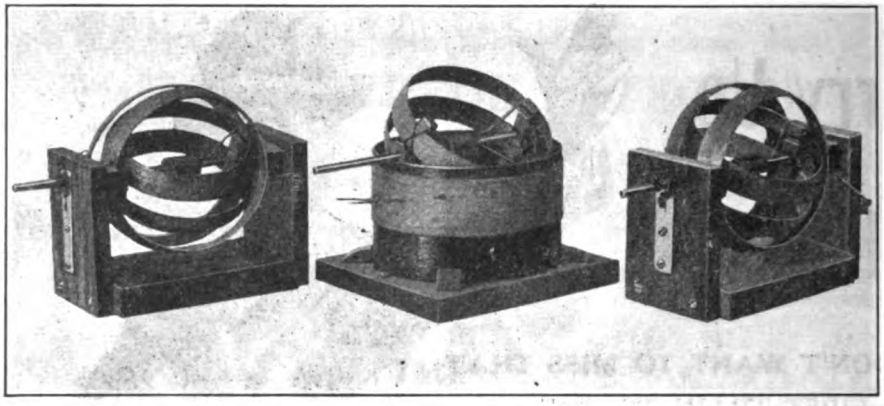
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No. 30	.85	1.24	.97	.53
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Price of ½ lb. spools double above list.

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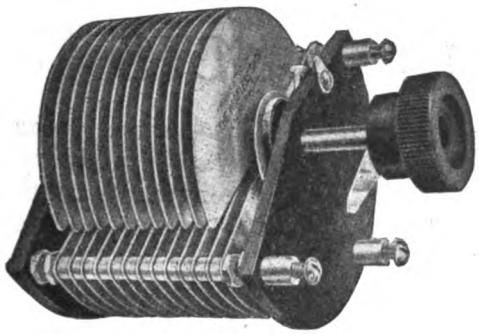
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This One Won't Give Trouble.

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Regularly equipped with knob and pointer and mounting screws. A metal dial will be supplied instead of the pointer at 75c extra, or a high grade moulded bakelite knob and dial with graduations filled in white, will be furnished at $1.00 extra.

Postal charges and insurance must accompany your remittance. Insurance on any CW condenser is only 5c. Isn't it worth it?

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LONG LIFE—CLEAR RECEIVING

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BURGESS "B" BATTERIES



All sizes from the Navy type down to the Baby "B." With and without taps

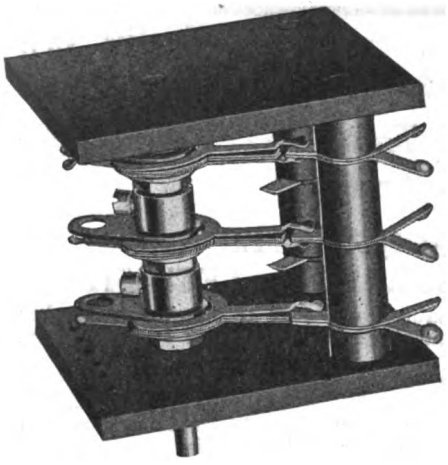
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Back Mounted Rotary Switch. Used for master switch employing bakelite insulation.

Price $4.00

Improved Spark Gap—entirely machined product. Provision made for interchangeable and renewable teeth. 9″ O.D.—teeth 1/16″ x 1″ special aluminum alloy. XX grade bakelite insulation. See cut in June QST

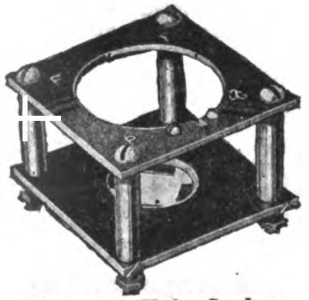
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118 SO. WATER STREET, SAGINAW, MICHIGAN



Type 126 Tube Socket

PRICE 75c POSTPAID

Something New

Made to please you and Priced to please your pocketbook

BY departing from conventional design in audion sockets we have combined the advantages of all, the disadvantages of none and a price lower than any. Think of it—a sturdy, easily mounted socket that is heat proof, has bakelite-dilecto insulation, handy binding post etc., all for 75c.

HERE'S a smooth running rheostat that takes panel space two inch in diameter, needs one hole to mount, has six ohm resistance, all off and all on positions and a brass panel bushing. Priced at 90c.

The WILCOX LABORATORIES
LANSING, DEPT. H., MICHIGAN



Type 122 Rheostat

PRICE 90c POSTPAID

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APPARATUS AND SUPPLIES

ROSE RADIO SUPPLY

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THE ELECTRIC SHOP

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Brandes Wireless Receivers are more sensitive—an improvement on Nature. The two telephones are perfectly matched in tone and this exclusive Brandes feature adds force to the supersensitive mechanical tympanums.

The minutest sound vibrations quivering through the air from out the far distances are caught and focussed into the clean, clear notes of the readable message—Brandes Headsets getting them all.



"Navy" type Headset. Price....$14.00
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It contains 200 pages, fully illustrating and describing the many instruments used in Radio service. Forty-five pages are devoted to general instructions, diagrams, station calls, tables, codes and other information identified with the art. The book is printed on highly finished paper with a two-color cover; size 9x5¾ inches.

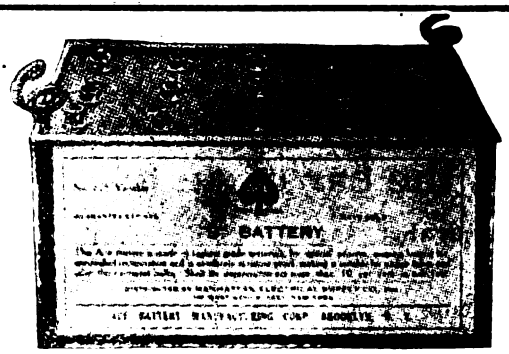
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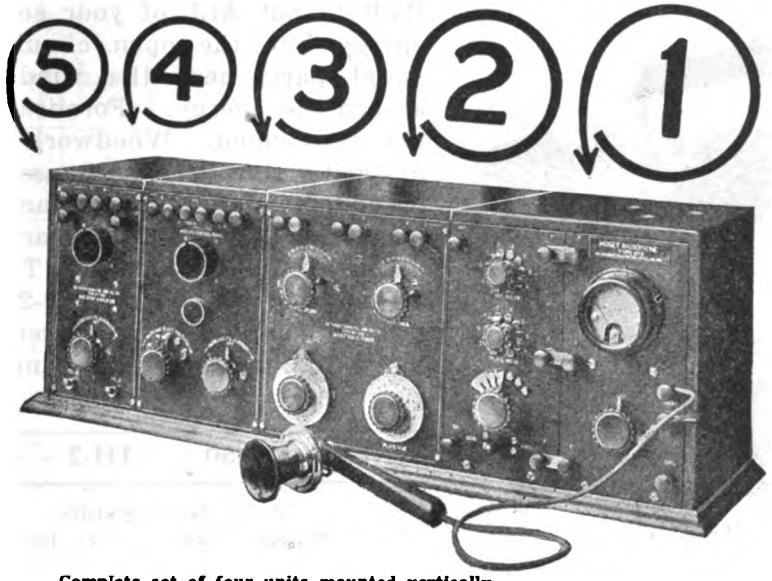
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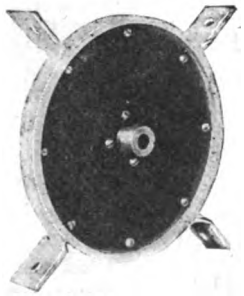
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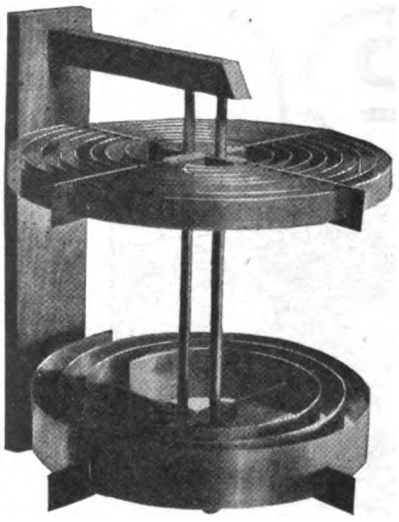
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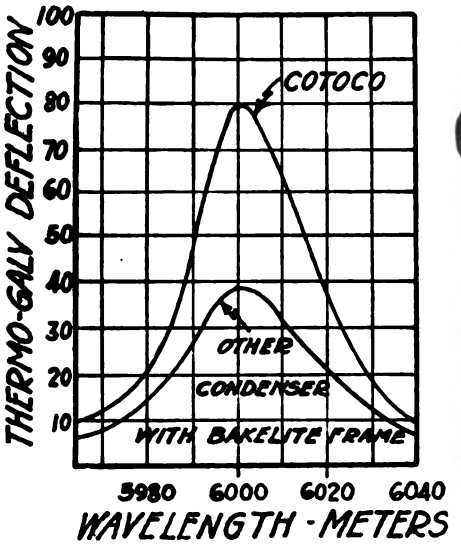


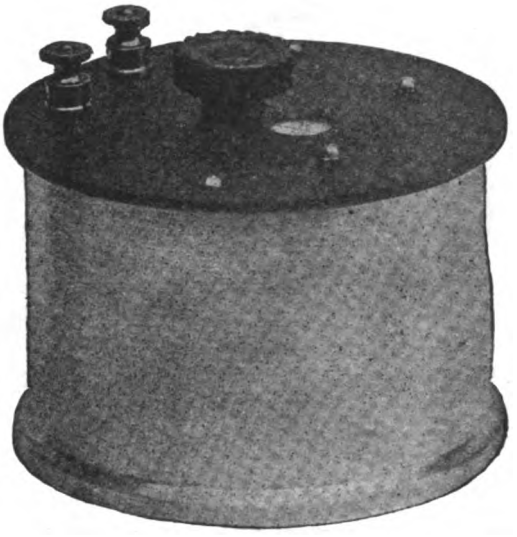
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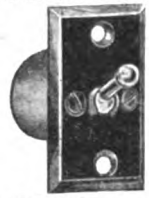


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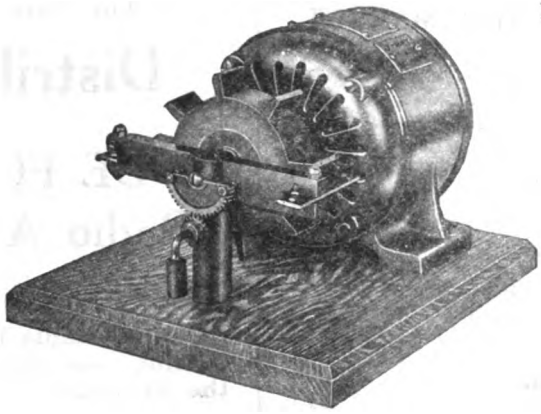


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The strongest construction and most accurate workmanship possible are found in this gap. Its sturdy and rugged build insures its giving the greatest satisfaction under the longest and most severe usage.

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Motor only $45.00. F. O. B. St. Louis, Mo.

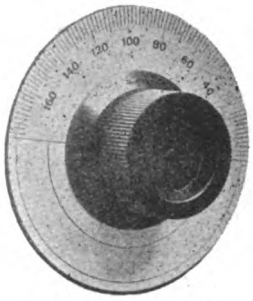
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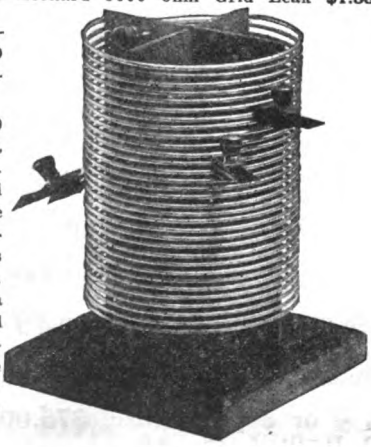


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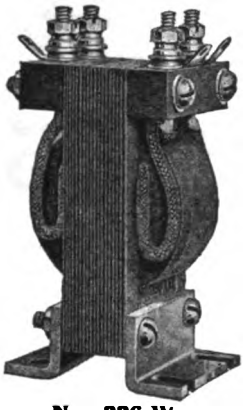
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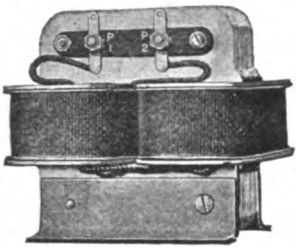


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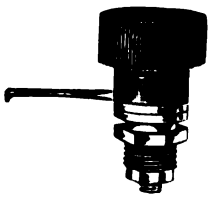
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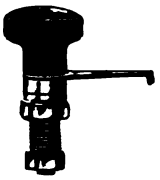
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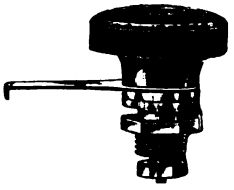
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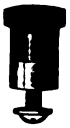
S # 1—50c.



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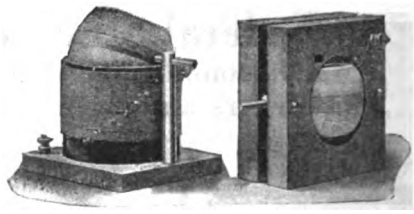
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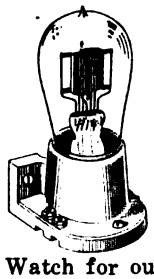
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FOR SALE: 900 volt direct current generator, $30; one Campbell, Model E, X-Ray outfit in oak cabinet with oak stand, tube, applicators, and all accessories, $40.00; One K.W. panel type transmitter as described August 1920 Everyday Engineering, comprising Acme type H1 transformer, plate glass in oil condenser, oscillation transformer, enclosed rotary gap with Emerson high speed motor, Weston thermo-couple ammeter, United Wireless 2 K.W. key, special bakelite antenna switch, and mica protective condensers. Absolutely complete; suitable for school or college, $185.00; Fleming, laboratory type, DC milli-ammeter, three range-10, 100 and 1000, $10; B battery box with potentiometer and switch mounted with two nearly new Burgess batteries, $5; Send for list of other items and parts. J. A. Hall, 1016 Iglehart Ave., St. Paul, Minn.

GENERATORS 10, 450 Volt 1-10 K.W. Westinghouse externally excited generators. New $20.00 each. Money back guarantee. Frank Creswell, 920 West 55th St., Los Angeles, Cal.

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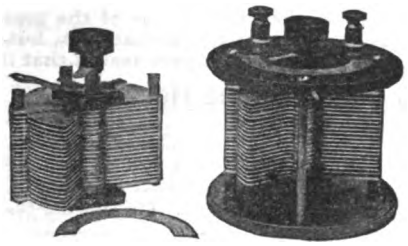
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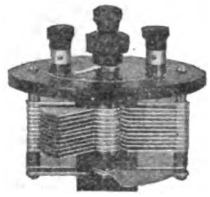
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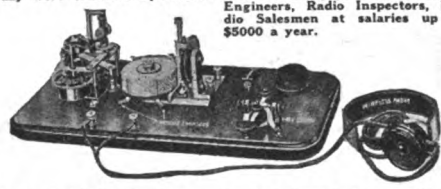
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It is made to fit the pocket—has heavy covers to withstand the wear and tear which it is sure to have at your hands because it will be your constant companion.

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The catalog contains 185 illustrations. On account of its great cost, this catalog cannot be distributed free of charge. It will only be mailed upon receipt of

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185 Illustrations

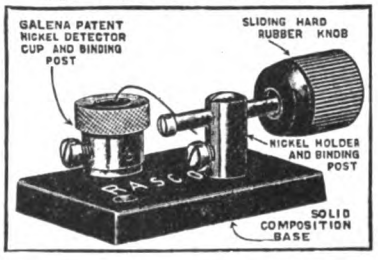
The Rasco "Baby"

Here it is boys! The smallest and most efficient detector in the world—as well as the cheapest. Our illustration is full size, and while the various details can be seen at a glance, we feel so enthusiastic about it that we must tell you all of its good points. First, there is a solid hard rubber composition base, size 1½" x 1½". We have not forgotten two holes to screw down the detector.

Then we have the nickle holder and binding post combined which holds the sliding, knurled, hard rubber composition knob. As you see, this knob not only revolves in its holder, but can also be moved back and forward in order to explore each point of the detector crystal.

Next we see the patent nickle detector cup and binding post combined. This is a little marvel all by itself and will not fail to awake your admiration. No clamps, no soft metal to fuss with. You simply unscrew the knurled cap and insert your crystal into the stand, screw home the cap which leaves a goodly portion of the galena exposed. The contact is perfect, while the crystal can be exchanged quickly in less than three seconds. By slightly unscrewing the cap, the crystal can be changed in position, in order to explore other sensitive spots. The catwhisker is of phosphor bronze and is attached to the horizontal bar by means of a filister head screw. Can be readily exchanged in less than two seconds. Wires can be connected to the binding post in a jiffy. All metal parts are nickle plated, and you will be proud of this little masterpiece.

THE RASCO "BABY"



No. 1898 Rasco Baby Detector complete with galena crystal, prepaid..... **50c**

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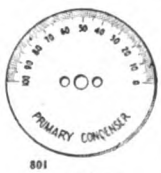
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Prices all styles *prepaid* ea. **30c**

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Do not compare these dials with some other makes as there is positively no comparison between them. Must be seen to be appreciated. Money back if not satisfied.

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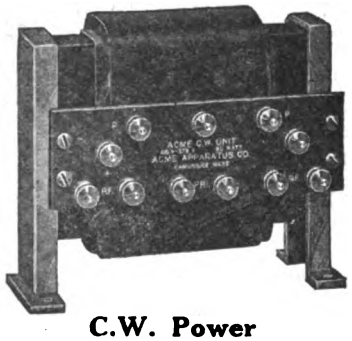
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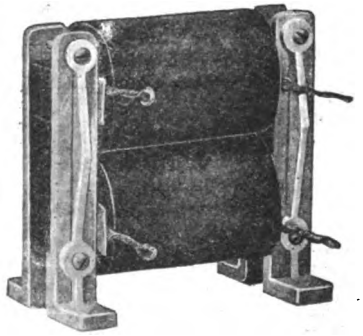
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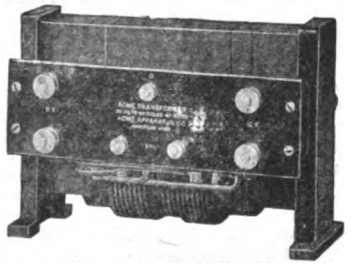
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200	12	5	250-550	200
		Two filament windings		
500	0	0	1000-1500	400
		No filament windings		
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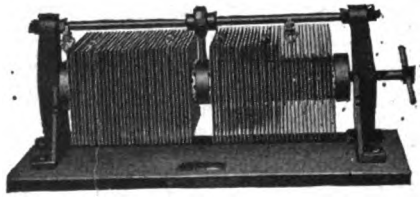
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TWO messages East, one message West, were relayed from Coast to Coast on Feb. 15th over the Amrad Transcontinental Line which consists solely of Amrad Gap stations. The lack of a nation-wide appeal to prevent QRM, the prevalence of heavy QRN in the East and the exclusive use of regular stock Amrad Quenched Gaps make this relay a unique bit of Radio History. 1XT, 2PL, 3VV, 8ML, 9PV, 9AFX, 5ZA, 6GE, 6DK and FD handled these messages, one of which covered the continent in four jumps, in less than 30 minutes. Critics who declare the Amrad Gap useless on 60 cycles and the hundreds of Doubting Thomases created by these critics are invited to send for our latest Bulletin Q which gives all the facts backed by actual proof. Here are a few Quenched Gap advantages:

¶ **Absence of Noise:** You can transmit all night and disturb no one. No vibration. Simply a purr.

¶ **Freedom from Trouble:** With our new leak proof gaskets, good for 3 months operation, you set up the gap once and forget it. No adjustments. One set of these new gaskets given free to Amrad Gap users who send gap number and 10c. postage.

¶ **Sharpness of Wave:** Used with an insulated counterpoise the decrement is very low. Your signals cause minimum QRM.

¶ **High Antenna Energy:** Very close coupling only can make this possible. Using an Amrad Gap the tighter the coupling the sharper the wave.

¶ **High Amplitude:** You must use a high voltage transformer to get maximum output at 200 meters. A high voltage transformer in turn produces maximum output at low spark frequencies. The 60 cycle note recommended for the Amrad Quenched Gap creates greater energy per wave train than any higher spark frequency regardless of type g used.

¶ **Service:** Our aim is to satisfy every present and future user of the Amrad Quenched Gap. We ask you to read carefully the peculiarities of quenched gap operation first; then buy with a willingness to follow our directions to the letter. Properly operated the Amrad Quenched Gap is the IDEAL gap; improperly operated it is not. Correct operation is just as easy as incorrect operation.

THE AMRAD TRANSCONTINENTAL LINE

1XE, 1OJ, 1EAV, 1XT, 1TS, 2PL, 3VV, 8FK, 8ML, 9PV, 9CS, 9BY, 9AFX, 5ZA, 6GE, FD, 6DK.

Inquiries invited from Amrad Gap operators desiring appointment on the line.

AMERICAN RADIO AND RESEARCH CORPORATION

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NEW YORK

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